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MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

JUNE, 1831.

On the Importance of Hygrometric Observations in Meteorology, and on the means of Making them with accuracy.

[Continued from page 229.]

On the 1st of April last, I hung up in the open air, two unglazed porous earthen pots, one in the sun, and the other in the shade, having first filled them with water.

The water which was used in filling up these pots every day, as it disappeared by evaporation, was supplied from bottles containing a known quantity, and at the end of the month, which was an uncommonly wet one, 37 oz. avoirdupois had been expended from the bottle supplying the pot in the shade, and 49 oz. from the other.

By calculating the number of square inches of surface which these earthen pots exposed to the air, (they are globes of 9¾ inches in diameter,) it appears that one inch and eighty-three-hundredths evaporated from the one in the shade, and 2¾ inches from the one in the sun. Calculating according to this latter rate, it will be found that 273 cubic feet of water are evaporated per day, at an average, from an acre of humid surface exposed to the sun: or allowing eight pounds to the gallon—2129 gallons per day, through the month of April—and this is probably about the quantity evaporated from 160 square perches of canal.

I am now carrying on a set of experiments which will test the evaporation from canals with more certainty. The quantity evaporated, however, must be much greater during the summer months.

I have constantly used the water in the porous pot kept in the

shade to ascertain the evaporating point, which was explained in the last number of this journal, and I do not yet despair of discovering a method of ascertaining the dew point, from the temperature of the air and the evaporating point alone.

My observations, since my last communication on this subject, will warrant me in saying that, when the temperature of the air is from 60° to 62°, the evaporating point is just half way between the temperature of the air and the temperature of the dew point—and that when the temperature of the air rises above this, the evaporating point is nearer the dew point; and when the temperature of the air sinks below 60°, the evaporating point recedes from the dew point. The exact ratio I have not determined. I have also had the pleasure of witnessing the fall of the dew point previous to every rain which took place during the month of April—and I now consider a sudden fall of the dew point, (unless this fall depends upon a change of wind,) a strong symptom of rain, especially if previous to the fall it stands above the mean of the month. The mean of the dew point for the month of April is 40.9—and for the temperature of the air, about 13 degrees higher, or 54°. For the first seven days of May, the mean of the thermometer was 56.6°, and the mean of the dew point 44.3°. A difference of 12.3 degrees.

In August, 1828, from the 9th till the 19th, the mean of the thermometer was 75 degrees, and the mean dew point 63. A difference of 12 degrees—the dew point ranging from 75° to 51°. During the remainder of the month, the dew point ranged from 72° to 42°, and the thermometer from 94° to 46°, which brings the mean dew point 13 degrees below the mean temperature of the air. This difference is just double what it is asserted to be in Great Britain, (see art. Hygrometry, Edinburgh Encyclopedia.) For there the difference at a mean between the temperature of the air and the dew point, is said to be between 6 and 7 degrees. Hence it will follow that evaporation is much greater here, particularly in the summer months, than it is in Great Britain. Greater, not only on account of the higher temperature, but on account of the greater depression of the dew point below the temperature of the air. It is highly important that this subject should be attended to in the United States. The greatest difference I ever observed, in the summer, though I presume it is sometimes more, was on the 30th August, 1828, two days after a very great rain—the dew point being 54°, and the temperature of the air 84°, at 12 o'clock. The greatest difference of last month was on the 20th, just before a great rain—the dew point being 41°, and the air 74°—amounting to 33 degrees.

The mean of 23 observations taken about sunrise during the month of April, makes the mean minimum temperature 47.3°, that is 7.3° above the mean dew point.

Now, the writer of the article, Hygrometry, referred to above, says, "The mean point of deposition, [dew point,] must be nearly the same as the minimum temperature of any place on a given day." Again he says, "it appears from a meteorological journal kept by the Rev. Mr. Gordon, that the minimum temperature of Perth, and

consequently, the mean point of deposition for that place, is about 6 degrees below the mean temperature, thus coinciding very nearly with the result formerly deduced from theory as the mean point of deposition for Great Britain, and the globe in general." Now my observations clearly prove the incorrectness of these theoretical views, and, of course, of all the calculations founded on them. It is true, on all nights in which there is dew, the bodies on which dew is deposited, must have been cooled down by radiation below the dew point; but even then, the temperature of the air 10 feet above the surface of the ground, may be, and frequently is, 6 or 8 degrees higher—and in all nights in which dew is not deposited, the minimum temperature must necessarily be above the dew point. In fact, nothing can be more fallacious than theory on the subject of meteorology: what theorist would have anticipated a fall of the dew point before rain? Nature must be interrogated, and she will give faithful responses.

I think it probably will be discovered, that the mean dew point for a month, is as far below the minimum temperature as the mean minimum is below the mean temperature—and if so, the mean dew point, the mean minimum, the mean temperature, and the mean maximum, will form an arithmetical progression. Such was the fact during the month of April—the common difference being $6\frac{1}{2}$ degrees, very nearly.

The discovery of this one fact, the falling of the dew point previous to rain, I consider of immense importance in the science of meteorology. It will lead, I trust, not only to the prediction of rain, but to the explanation of many other phenomena, never yet explained. For example, on the 19th of April, about 9 o'clock, a most brilliant Aurora Borealis appeared for a short time; on the same evening, at 6 o'clock, the dew point was taken, and found to be what it had been for several days before, 55°. At half past 8 it was taken again, and found to be 45°, that is, in a very short time, it had fallen 10 degrees. Now that these two things were connected together, as cause and effect, is highly probable. Let observations be multiplied on this subject. The dew point, however, did not stop here; it continued to fall, till the 22nd, when at 6 o'clock, P. M. it was down to 35, and shortly after this, it began to rain.

It is proper to mention here that the porous pot does not give the true evaporating point, when there is a sudden change in the dew point, because it cannot instantly assume the corresponding temperature. Indeed once during the month of April, when there had been a very sudden rise in the dew point, the evaporating point, as taken by the pot, was below the dew point. A skilful observer will be aware of this, and guard against it. I might mention here that the temperature of the water in the pot was once observed to be $2\frac{1}{2}$ degrees below the freezing point; and although the water was agitated by dipping the bulb of the thermometer into it, it did not freeze.

If these observations should meet the eye of the writer of the article, "Hygrometry," mentioned above, I hope he will be induced to observe with greater care whether the mean dew point is really 6

degrees of Fah. below the mean temperature of the air in Europe; for as it is at least double that quantity in this country, and as his theory is undoubtedly wrong in making the mean dew point the same as the mean minimum temperature, I greatly suspect, that upon further investigation, it will be found, that the dew point has been estimated by this writer, too high. In countries where there are heavy dews every night, the mean dew point may approach very near to the mean minimum temperature of the air; but even there the latter temperature must always be a little above the former.

If any gentleman in this country has made observations on the dew point, this most interesting department of meteorology, he will confer a great favour on the public, and particularly on the writer of this article, by communicating the results to the editor of this journal.

From a meteorological journal kept by Mr. E. M'Pherson, at the corner of Chesnut and Broad streets, 45 feet above the level of the sea, it appears that the mean of 22 observations of the barometer, at 9 o'clock, A. M. is 30.026 inches, and the mean of the same number at 5, P. M. is 29.968; the former being nearly six-hundredths greater than the latter: which is in perfect accordance with the theory proposed in my last communication.

I will endeavour to furnish you with observations from Mr. E. M'Pherson's Journal for the month of May, on the dew point, and the evaporating point, with the cotemporaneous temperature of the air;—and if such lines should hereafter be incorporated with the table furnished by your correspondent in Germantown; and an additional line should be added, stating whether there is dew or not—and if, under the head of General Remarks, be added every remarkable phenomenon—particularly how much the dew point falls before it begins to rain—and how much it falls without raining—whether a sudden fall of the dew point is attended with a sudden fall in the temperature of the air,—and *vice versa*—and whether these phenomena do not sometimes occur without any apparent cause from the change in the wind—at what time great rains commence and terminate, and, occasionally, how many degrees a thermometer in the sun rises above one in the shade—and how much colder one is, after dark, exposed on the grass to the open sky, than one not so exposed: then will my wishes on this subject be gratified.

Philadelphia, May 10th, 1831.

On Sharpening Razors by Burnishing.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—In the Journal of the Franklin Institute, Vol. 7, No. 1, for January, 1831, you have given an account of an instrument and process for sharpening razors, &c. By Thomas Andrew Knight, Esq.

I have had the same thing in contemplation for more than seven years, but through disappointment by the instrument maker, have

never brought it to perfection. You were acquainted with my first essays on this subject.

From subsequent experiments, I am fully satisfied that the instrument should be made, not to cut or abrade, but to give a fine edge to the razor by burnishing only; it, therefore, should be made of the finest cast steel, as hard, and polished as highly, as possible; and in the using, it is only necessary to smear it over with a little sweet oil, as a medium to prevent the edge of the razor from coming into too close a contact with the burnisher, and so prevent abrasion. By this procedure I give my razor a highly polished, and an exquisitely smooth edge; and by thus burnishing the edge it is made hard and durable. In other respects it should be used according to the directions of Mr. Knight, to which I refer.

My Burnisher, (exclusive of its handle,) is about 4½ inches long, of an oval figure, with one side flat, like the annexed sectional drawing. The advantages of which are, that the flat side may be used for a soft razor, the broad round side for a harder, and the narrow edges for the hardest: by thus proportioning the surface of the burnisher to the temper of the razor, you gain the best effect.

Sir, yours respectfully,

JOHN MEER.

Philadelphia, May 5th, 1831.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN FEBRUARY, 1831.

With Remarks and Exemplifications, by the Editor.

1. For a *Machine for Cutting Sausage Meat*, and stuffing the same. Samuel Fahrney, Boonsborough, Washington county, Maryland, February 1.

Mr. Fahrney obtained a patent, or patents, for machinery for the same purpose, about two or three years ago, but of a different construction from the present. There was considerable resemblance, however, in the stuffing part, which therefore is not claimed in the specification before us.

The machinery used cannot be well described without a drawing, and this we do not think it necessary to give.

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2. For a *Plough;* John Anthony, Zanesville, Muskingom county, Ohio, February 1.

The patentee says, that he has "invented a new and useful improvement in the manner of fastening, or attaching, the cast iron mould board of the plough, to the wrought iron share." This is all that he claims to have done, and as we are not aware that the improvement is a very great one, we shall content ourselves with telling what he has done, without explaining how it is effected, as we could easily devise several modes of accomplishing the same end, neither of which we should think worthy a patent.

3. For an improvement in the *manufacture of Potash;* Thomas H. Sherman, Hastings, Oswego county, New York, February 2.

We have in this specification the announcement of some magnificant chemical discoveries; one of them is that salt will burn up, and that lime will become potash. Lest those who are adepts should be inclined to doubt, we will give the discovery in the words of the philosopher to whom it is due.

"The compound used is salt, lime, and lamp oil. First, when beginning to melt after the salt has done rising, it can then be ascertained what quantity of potash you are going to have. Suppose one barrel; first take a half a bushel of salt, sprinkle half of it over the top of the potash. Secondly, take two bushels of slaked lime, add that in the same manner, then the remainder of the salt; and when the lime has disappeared, then add half a pint of lamp oil. This is the quantity used for one barrel, but it may be varied as the nature of the case may require. First the use of the salt is to create a heat, and to purify the potash, as it is supposed to burn up and add nothing to the quantity, but to the quality. Secondly, the lime is supposed to melt and become the first rate potash. Thirdly, the oil is to create a blaze to consume. Fifth, these are the contemplated uses of the above ingredients as used by me.

THOMAS H. SHERMAN."

If a patent had been required for deteriorating one of the staples of our country, the one under consideration would most completely have fulfilled the intention; and it is earnestly hoped that its validity may in some way be tested in our courts of law, where we apprehend, it would not be esteemed to be a "useful invention," according to the intention of the patent law; as its inevitable result if acted upon, must be to injure the reputation of American potash in foreign countries; the material would be entirely spoilt as regards its use in many manufactures.

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4. For an improvement in the Cylindrical *Sheet-iron Cooking Stove;* Emma Steinhour, city of Philadelphia, February 3.

The petition informs us that the invention is an "improvement upon the cylindrical sheet-iron stove used in the burning of anthracite; by appropriating the heated air thereof, after it has passed through the body of the fire, to the purposes of roasting, boiling, baking, and performing a variety of culinary operations by means of different apparatus and fixtures."

The foundation of the apparatus is the ordinary round sheet-iron stove, lined with fine clay. Kettles with tubes projecting from their sides, are made to boil by passing these tubes through the sides of the stove. The heated air, instead of being at once conducted off, is to pass through a tube into a sheet iron-box, or roaster, in which meat, &c. is to be roasted. From this a pipe conducts the warm air into a hollow sheet-iron shelf, upon which plates, dishes, &c. may be placed, and from this it is finally carried into a flue, by a pipe. The

top of the stove takes off, and may be replaced by an oven, or by boilers for vegetables.

The claims are to the mode of roasting by heated air; of boiling around or on the top of the stove, and at the same time of baking and roasting by means of heated air; for heating flat irons, broiling, frying, &c.

We have received assurances from persons who tested the goodness of this stove in their own families, and who are well qualified to judge of its merits, that it is well adapted to all culinary purposes; that it is very economical, and that the most delicate food does not acquire any unpleasant flavour by its exposure to the gas which has performed the office of combustion.

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5. For an *Inclined Water Wheel;* William H. Squires, and Coral C. White, Ledyard, Cayuga county, New York, February 5.

This inclined water wheel is placed in the manner of the inclined wheel upon which horses, or other animals, are sometimes made to walk, and propel machinery. Buckets are formed around the periphery, on the upper face of the wheel, and the water is received upon its upper, and discharged on its lower edge.

When the water is low, and a greater power is wanted, it is proposed to place a horse upon the wheel, and thus to obtain the combined action of the animal and the water. When this is to be done the face of the wheel must be floored, and the flooring allowed to cover the inner ends of the buckets.

There is no claim made, and the patentee therefore supposes the whole arrangement to be new; in this, however, he is in error. There has long been in the patent office a model of such a water wheel.

We do not perceive in what particular this wheel possesses advantage over other modes of applying water.

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6. For an improvement in the apparatus for *Applying either simple or medicated Steam to the human body;* Boyd Reilly, Cincinnati, Hamilton county, Ohio, February 5.

This, as will be seen by the title, is a steam doctor's apparatus. The culprit—patient we mean—is to be laid upon a couch made for the purpose, and is to be covered over with a frame made of hoop iron, covered with cloth, &c. so as to have the form of a wagon top. The cloth is to be varnished, to render it steam tight, and is fitted perfectly to the frame of the couch. An opening is left at one end for the head of the subject, and the opening closed around his neck by means described in the specification. A tube from a metallic apparatus for heating the materials to be converted into vapour, opens into the cavity of the apparatus. The vapour of water, either simple or medicated, is sometimes to be used, but the favourite application appears to be sulphur.

The *familiar* tells us that "when sulphur is used it discolours the

skin of the hands, until the scarf skin peels off. This may be prevented, if desired, by having coverings for them of the same material as that for the neck, the penetrating nature of the sulphur causes it to be painful to [parts of great delicacy,] they should be covered by a bag in like manner."

"Although I have made this application some hundreds of times, being a mechanic, I require the patient to take medical advice in cases of difficulty. In simple cutaneous or rheumatic cases, I pursue the following course. If the patient's skin is in a dry state, I generally cause perspiration in a few minutes by steam from half a pint of water;" "the water being removed, a full half ounce of roll brimstone is put into the empty vessel, which in this small apparatus takes as long to burn as the patient can conveniently remain in it." "In this recumbent position the patient seldom feels faint unless previously reduced. Should such symptoms appear, the sulphur may be removed to the back of the fire place, the usual applications being made to the patient, such as admission of fresh air, vinegar, cold water," &c.

It is useless to waste reasoning upon those who appear by their acts, to consider ignorance and temerity as the best diploma which can be exhibited of the skill of a professor of the healing art; and whilst this class of patients is numerous, freebooters will be found in abundance, who, taking advantage of popular ignorance, are ready to sally forth, to "burn, sink and destroy."

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7. For an improvement in *Boxes and Hubs for Carriages*, and in Ship Blocks, and boxes for machinery; Isaac Cooper, city of Baltimore, February 7.

This is a modification of Garnett's friction rollers, but, in our judgment, is no improvement upon them. Round the axle, and within the hub, or box, four rollers are to be placed. These rollers are not to have axles, but are to roll round upon the main axle and within the hub. Between these rollers four others are to be placed, one between each, and of about half their diameter; the whole when together are to fill the circle. The smaller rollers are kept in their places by a flanched ring at each end, to enter which they exceed the larger rollers about an inch in their length.

The claim is, to "the principle of the roller without any axle, as applied to axles, shafts," &c.

This plan will not remove any of the difficulties experienced with similar rollers; as, in Garnett's plan, the axles, which merely confined them in their places, occasioned but very little friction. We err greatly if the rollers without axles will not, by continued use, produce more friction than the former.

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8. For a machine for *bending Tin Hoops and Bands*; Daniel Shepardson, Hamilton, Madison county, New York, February 7.

The bending is to be performed by means of three rollers, in a way well known to workmen. The machine is so constructed that the distance of the rollers may be varied, according to the size of the hoop to be formed. The drawing accompanying the specification is sufficiently descriptive, and has abundant references to it. The written description, however, is extremely meagre and inadequate, and there is no claim made. This is to be regretted, as the particular arrangements appear to have been devised with much skill, and the general principle is not new.

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9. For a *Thrashing Machine;* William Emmons, city of New York, February 7.

This contains all the usual appendages of thrashing machines. The teeth upon the cylinder are to be in rows, and from 1 to 1½ inches long. They are to be bent back so as to form a semicircle, declining from the grain. The hollow segment is to be borne up by spiral springs. The claims are to "the peculiar construction of the cylinder, in contradistinction from any other before known. The form of the teeth turning back in a semicircle. The form and construction of the circular bed, with the teeth, and the manner of setting it on springs."

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10. For a *Thrashing Machine;* Truman Fox, and Wm. G. Borland, Little Falls, Herkimer county, New York, February 8.

We have again a thrashing machine of the ordinary form, with the addition, however, of a fly wheel, which is an appendage not attached to the whole of them; nor is it necessary when the cylinder is weighty and has a very rapid motion.

"What we claim is the construction of the receding concave, by means of springs, or lever and weights; and the staple teeth; and the fly or balance wheel."

The teeth are formed of wire, and bent so as to drive in at both ends, like a staple: this, we believe, is new, but the other parts claimed have so many previous claimants, that it is impossible to designate the true and original owner, though we can with some confidence say who is not so.

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11. For a *Reaction Water Wheel,* for impelling saw mills and other works; Joseph C. Strode, East Bradford Township, Chester county, Pennsylvania, February 8.

(See specification.)

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12. For an improvement in the *Carpenter's Plane;* Phinehas Meigs, Madison, New Haven county, Connecticut, February 9.

The objects to be attained by this invention are to cause a single iron to have the effect of a double iron; and to secure or detach it with greater facility than in the ordinary mode of fastening. The plane is, in fact, a double iron plane of a peculiar, and, undoubtedly,

a new construction. The opening, forming the mouth of the plane, is mortised through in the usual manner, excepting at the ends, which are perfectly flat, as no wedge is to be used. A plate of iron is let in on each end of the mortise, extending from the top to the face of the plane, and secured in its place by grooves, into which its edges fall, and by a screw passing into the stock. A flat plate of iron, similar to the cap of the double iron, has a pin projecting from each side of it, at about three-fourths of an inch from its lower end; these pins pass into grooves prepared for the purpose on the side plates, and a joint is thus formed upon which this cap iron moves; the pins rest upon the bottoms or lower edges of the grooves, which keep the iron at a proper distance from the face of the plane. Near the upper end of this cap piece, there is a thumb screw, which serves instead of a wedge to fasten the cutting iron. The cutting iron is dropped into its place, between the cap iron and the stock; when there, the thumb screw is turned, and its point bearing on the cutting iron, throws the lower edge of the cap against that of the cutting iron, and fixes it in its place; the whole bearing being against the pins in the groove.

The claim is to the peculiarities described.

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13. For a mode of *building Double Ovens in Chimneys and large Bakeries;* Reuben Bacon, and William E. Marshall; Walpole, Cheshire county, New Hamphire, February 9.

In the description given of this double oven, there is a degree of obscurity which we are unable to remove. It appears, however, that two ovens, one above the other, are to be formed of brick or freestone; the top of the lower constituting the bottom of the upper oven. They are to be built in the jamb of a kitchen fire place, as they are thus shown in the drawing; but in this there is no provision represented for using the heat from the ordinary fire, nor are we any where told where the fire is to be made; we learn, however, from the intimation in the claim, that it is to be below the lower oven. This of course disconnects it from the fire place, excepting so far as a flue may be concerned.

The patentees say, "what we claim as our invention, is, the construction of the double oven; or two ovens, one over the other, as hereinbefore described, which are both to be heated by one fire made in, and applied to, the lower apartment of the double oven."

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14. For a *Thrashing Machine;* John Harman, Jr. Upper Wakefield, Bucks county, Pennsylvania, February 11.

The patentee says:—

"In this improvement I claim the concave of plank, channelled and faced with iron; the scourer, or upper concave of plank, channelled and faced with leather, the leather extending from the face of the concave; the beaters made of wood or iron, attached to the cylinder, in a triangular form, so as to strike the unthrashed grain in an angular direction; and the cylinder boxes regulated by screws."

The upper concave, above mentioned, is a semicircular covering to the cylinders, which cover has channels, and strips of sole leather within it for the purpose of rubbing out clover, or other seed. "When this part is used, the seed, &c. enters the machine at the other end from that at which grain enters, is carried upwards by the beaters of the cylinder, and rubbed, or scoured out, between the beaters and leather filletting of the upper concave or scourer."

In other respects this machine resembles the ordinary thrashing machine.

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15. For a machine for *Felting and Napping Hats;* Thomas J. Cornell, Randolph county, Vermont, February 11.

The hat body is to be bowed, set up, and basoned in the usual manner, it is then to be rolled up in the sticking cloth, when it is ready to be operated upon by the machine, which consists principally of a vibrating rack, and a revolving apron. The machine is placed over the kettle, into which a pump passes, the piston of which is operated upon by a part of the machinery, and supplies the hot liquid necessary to the operations of felting or napping. The structure of the different parts, and the gearing employed, cannot be described without drawings. The claim is to "the method of felting and napping of hats by means of a vibrating rack, and a revolving apron."

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16. For an improvement in the *Manufacture of Gas for Illuminating Purposes;* Joseph Barton, of the city of New York, and a resident for two years in the United States, February 11.

(See specification.)

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17. For an improvement in the *Manufacture and Setting of Porcelain Teeth;* Samuel Chamberlain, city of Philadelphia, February 11.

Pieces of platina wire are imbedded in the composition of which the tooth is made, previously to its being baked. These wires project from the top of the tooth, and to them the gold plate is to be soldered, by which the tooth is to be attached. There are some other points which are considered improvements, as will be seen by the claim.

"What I claim as new, and as my discoveries and inventions, are the glazing or enamelling the inside of the tooth, and polishing the gold plate, so that no unpleasant roughness may be presented to the tongue, and the tooth may not absorb moisture from the mouth."

"The manner of fixing the tooth by means of the pieces of platina and gold plate; and by soldering the spring that secures the tooth in the mouth to both the gold plate and the plug in the top of the tooth, which fixes the whole more firmly."

"The method of securing the tooth differs from all others in this essential particular, that is, that there is no interstice between the

plates, or between the plate and the tooth, for food or moisture to collect."

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18. For an improved *Machine for Cutting Sickles*, and which may be used with equal advantage and facility in cutting files; Simon Hornbenk, Lafayette, Tippecanoe county, Indiana, February 11.

The sickle, or file, to be cut is laid upon a suitable bed, which is carried forward like the carriage of a saw mill, by means of a rack and pinion. A crank is to be turned by hand, which gives motion to feed hands, operating upon cog wheels, in the ordinary manner. There are four teeth, or lifters, on the crank shaft, for the purpose of raising a hammer, which, in its fall, strikes a punch that is to cut the sickle or file.

For cutting sickles such a machine may possibly answer a good purpose, but for cutting files it is altogether worthless. We speak with confidence upon this point, as machines somewhat similar, but constructed with much greater skill, have been frequently tried. The best which has been made was one executed with the utmost exactness, by the late Mr. Voight, chief coiner of the mint of the United States, who was well acquainted with the nature of file cutting; his machine, however, has never come into use. The best mechanists of England and France also have failed in similar attempts, and that from the inherent difficulty of the subject.

The force of the blow requires to be varied, not only on different pieces of steel, but also upon different parts of the same piece, in consequence of the difference in its texture. The hand of the skilful workman soon becomes habituated to this difference, and adapts itself to these variations; but a machine never can be made to do this, however intellectual its inventor may be.

There is no claim made, and as there is little or no novelty in the machine patented, there was little or nothing to claim.

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19. For an improvement in the *Mill for Grinding Corn*, and other grain; Elisha Bigelow, city of Washington, D. C. February 11.

Should the utility of this invention be commensurate with its simplicity, and the brevity of the specification, it will be almost invaluable. *To avoid prolixity*, we will give the whole description, as furnished by the patentee.

"My improvement on the mill for grinding corn, and all kinds of small grain, likewise plaster of Paris, may be applied to all mills which are now, or may hereafter be put into operation. Make an aperture through one of the stones; it is thought best to make a number of apertures through the cap stone, or runner, according to the size of the stones. By this improvement being applied, any required momentum may be given to the stones, and the atmosphere having a free circulation through the apertures will prevent the meal from clogging or heating." "ELISHA BIGELOW."

The drawing represents an upper stone with a number of holes drilled through it.

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20. For machinery for *making Bats for Hat Bodies;* Stephen Hurlbut, Glastenbury, Hartford county, Connecticut, February 14.

The wool is to be received from a common carding machine upon an endless apron, which apron receives a vibratory motion, that it may cross the wool as it delivers it upon the former. "The former is a light wheel, or table, having a horizontal rotary motion; and on the former is a roller; the roller is attached, by a swivel in its centre, to the apron on the former, and its outer or extreme end is secured to the frame of the carding machine, by means of a swivel and wire."

"The operation of the machine is as follows:—The web is received from the doffer of a common carding machine upon the apron. It is carried by the apron to the former, and by the vibratory motion of the apron the web is crossed, as it is received between the former and the roller. The variation in thickness of the bat, for the formation of the body, must be regulated by the feed of the carding machine. The size of the bat for the formation of the body is regulated by a limb from the standard of the apron to which there is a crank pulley. When the bat is completed, it is torn from the circumference to the centre, gradually rolled over, and following the former through one of its revolutions, is taken off without stopping the machinery. The bat is then divided into three equal parts, which forms three hat bodies."

"My claim for a patent is to the whole of the foregoing description attached to the carding machine, and for crossing the webbing, and making the bat."

The drawing which accompanies this specification is a very imperfect one; and is not indeed worthy the name of a drawing, although it serves to give some general idea of the plan. The claim as it stands would seem to include the revolving apron; in this case it appears to be too broad.

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21. For an improved *Machine for Spinning Wool;* David Wooster, Sheldon, Genessee county, New York, February 14.

The common wheel for spinning wool is to be made to turn a number of spindles,—eight are shown in the drawing. The rolls of wool are to be fixed in an apparatus to be held in the hand: this contrivance consists of two strips of wood, 18 or 20 inches long, hinged together, and capable of being opened and closed readily, and in this the rolls are to be secured. There is nothing in the arrangement to recommend it to particular notice, nor is there any claim made.

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22. For a *Thrashing Machine;* Jacob Ketzle, and Jesse Bevier, Ithaca, Tompkins county, New York, February 14.

"What we claim is the teeth in the bars upon the cylinder acting upon the grain over the concave of bars, with or without teeth; and also the cylinder being fixed and stationary, so that it cannot raise or fall except at pleasure."

These claims are no doubt as good as any that could be made to the machine described. The difference between the teeth of this machine and many others, is, that in this, they are made on plates of metal like saw teeth, and fixed along the cylinder.

There has never been a dearth of newly patented thrashing machines, but of late they have sprung up with a rapidity quite unusual; this is to be attributed to the success of one or two patentees, who, if their machines are not of a superior order, have been indefatigably active in bringing them into use.

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23. For an improvement in the mode of *Pressing Cheese*, by a "Lever and eccentric wheel cheese press;" John C. Pulsifer, and Ebenezer Pulsifer, Ipswich, Essex county, Massachusetts, February 14.

An eccentric wheel is placed upon a shaft which crosses the press horizontally; this comes in contact with a roller, or friction wheel, on the top of the follower. When the shaft is turned by a lever, the eccentric wheel is brought into action, and weights hung upon the lever will cause it to operate continuously.

Presses with double and single eccentric wheels, acting exactly upon the principle of the press described, are no novelties. The patentees do not make any claim.

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24. For constructing *Stoves, or Flues, for the Curing or Drying of Tobacco;* D. G. Tuck, Halifax county, Virginia, February 15.

(See specification.)

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25. For an improvement in the *Plough;* Timothy Miller, Pittsburg, Allegheny county, Pennsylvania, February 15.

The patentee states in his petition that his improvements consist in "a moveable piece on the side next to the land, and forming part of the under side, from the heel, or hinder end, to about half the length of the land side, or runner of the plough, which, when worn at the heel, can be renewed at any time, by unscrewing the old, and putting on a new *renovater*."

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26. For an improvement in the *Overshot Bucket Wheel* used in Hydraulic works, or machinery; D. S. Howard, Lyonsdale, Lewis county, New York, February 16.

(See specification.)

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27. For an improvement in the apparatus for Distilling

Charles Otis, Tunkhannock, Luzerne county, Pennsylvania, February 16.

(See specification.)

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28. For an improvement in the *Manufacture of Buttons* called "Metallic Shank Buttons;" Josiah Hayden, Williamsborough, Hampshire county, Massachusetts, February 17.

Who is the true and original inventor, or discoverer, of this improvement in buttons, we wot not, but the present patent is taken for the same mode of making buttons as that described in the last number, (No. 22 on the list,) and such is the resemblance in matter and manner, that it is probable they are both from the same mind, although the claimants reside no small distance apart.

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29. For an improvement in the *Steam Boat Paddle Wheel;* Timothy Hunt, Boston, Massachusetts, February 17.

This is another patent for a mode of causing the paddles of steamboat wheels to enter and leave the water vertically. The general arrangement is similar to that of several others which have been patented both here and in England. Two wheels eccentric to each other operate upon the buckets; the particular arrangements in the present case are made with great skill; the specification and drawing fully and clearly present the whole design, and the parts claimed are distinctly designated: we apprehend, however, that the practical difficulties which have prevented the adoption of similar plans, will not be removed by that before us.

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30. For an improvement in the *construction of Steam Boilers;* Levi Disbrow, city of New York, February 18.

(See specification.)

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31. For a mode of *constructing the Rotary Steam Engine,* called the "Double Chamber Rotary Steam Engine;" Joel Eastman, Bath, Grafton county, New Hampshire, February 18.

The patentee informs us that "the rotary or revolving part of this engine may be constructed in various ways, not essentially differing from other rotary engines; the distinctive character of my engine being the employment of two chambers upon the same shaft, by which the action upon the fixed heads, is rendered equable."

The steam is admitted and discharged through openings in the fixed heads; and to them are attached the metallic stops which fill the chambers, and cause the steam to react upon the valves. Instead of the ordinary stuffing, it is proposed to close the juncture between the revolving cylinder and the fixed head, by driving wood, endwise of the grain, into a groove prepared to receive it, which being turned off, is to run against the metal.

The claim is to "the employment of two chambers on the same

shaft, in which the heads that form the exterior ends of the chamber are fixed, or stationary, and by the use of which two chambers the force or action upon each end is equalized."

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32. For a *Water Wheel for Mills*, in which the floats work upon hinges, or joints, and are enclosed within the rims of the wheel and a circular apron; Joel Eastman, Bath, Grafton county, New Hampshire, February 18.

"This water wheel may be made of cast and wrought iron combined; its diameter may vary from two to six feet. The rim of the wheel is to be partially surrounded by a circular case, or apron, which will confine the water within the rims, and between the buckets or floats. The floats are made to work upon joints, or hinges, and the water is conveyed on to the buckets, or floats, through a penstock, or close trunk, extending the whole height of the fall. The buckets, or floats, are to be opened and closed by apparatus appended to the wheel, to the frame, or to the plummer block on which it rests."

The junctures of the revolving parts are to be closed by strips of wood, driven into grooves, as in the foregoing article.

The claims are to the application of a water wheel constructed as above described; that is, with floats or buckets, which are opened and closed mechanically, independently of the action of the water, and the confining the water within the rims, by means of a case, or apron, whilst operating upon the floats, or buckets.

The motion of the buckets upon their hinges is effected in a manner similar to that of the valves in several rotary engines.

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33. For a *Machine for Pointing Pegs for Boots and Shoes;* William A. Greenwood, Palmer, Hampden county, Massachusetts, February 19.

Although the drawing which accompanies this specification represents the whole machine very well, yet those parts upon which its operation principally depends, are neither shown or described in detail. There is a part called the cutter, which is to point the pegs, and, we suppose, from the general representation, that it operates like a plane, with a sharp angle, and grooves the end of the block which is to be split into pegs. A carriage upon which the block is placed is made to advance by regular steps, as the cutter works. The whole is set in motion by means of a crank. The claim is to the whole of the foregoing machine.

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34. For an improvement in the *Sawing of Boards* by means of a machine called the Economical Sawyer; Reuben Jacobs, Wilton, Saratoga county, New York, February 22.

"The objects proposed to be accomplished by the economical sawyer, are to saw boards and other timber without a stubshot, and to gauge the thickness of the board, or other thing, into which the

saw log is to be sawn, and to keep the saw log plumb while it is being sawed."

The mode of effecting these objects is particularly explained in the specification; the head blocks of the carriage of a common saw mill have the dogs so constructed and arranged, and there is a rack and pinion for the purpose of moving the log, constructed in such a way as to attain the proposed ends. The claims are to the particular parts represented as the invention of the patentee.

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35. For a *Machine for moving Earth, Stones, &c.;* Shadrach Davis, Dartmouth, Bristol county, Massachusetts, February 22.

The body of this machine resembles the common scraper used for removing earth; but, instead of a straight cutter, the edge is formed into points like those of the shovel plough, which are intended to cut the ground more easily than the ordinary cutter.

It is proposed to mount this scraper upon a carriage, with wheels, so constructed, that by means of shafts and chains acted upon by levers or cranks, it may be lowered, to allow its points to enter the ground, and that when loaded it may be raised and removed where required. When the earth is to be deposited in the vicinity, it is to be used, like the common scraper, without a carriage. The claim is to "the points, or shares with cutters in the fore parts; and the application of said scraper to wheels, and the form of hanging it; together with the applying of said points to scrapers drawn without wheels."

The drawing accompanying this specification, which is referred to throughout, is wretchedly executed, leaving most of the parts, and all the particulars, to the imagination.

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36. For an improvement in making *Bedsteads;* Rufus Belt, Centreville, Bourbon county, Kentucky, February 22.

The great improvement here claimed has been so often patented, that if the mere act of patenting will afford security, it must by this time be well secured. On one end of each rail there is to be a right hand, and on the opposite end a left hand screw, which are to screw into the opposite posts by turning the rail one way. Were the contrivance new, it would still be a poor one, and we apprehend that age has not improved it. Those who know any thing about cutting screws, especially in wood, are aware that it is nearly impossible to cut two which should bring up to the shoulder correctly, and that were they made to do so at first, they would still wear and strain unequally.

There have been at least three patents for this very same affair granted within three years.

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37. For a *Fire Engine;* Nathan Pierce, Whitehall, Washington county, New York, February 23.

Two cylinders are to be used in this engine, each of which is to act as a double forcing pump; having a supply and a discharge pipe at each end, with their proper valves, and the piston rods working through stuffing boxes. The four supply pipes terminate in one common suction pipe, and the four discharging pipes also unite in one.

It is proposed to work this pump by turning a crank, or cranks, from the shaft of which pitmen operate upon the pistons of the barrels. No mention is made of an air chamber. There is no claim made, but we are told that "some among the many advantages of an engine constructed upon the principle above mentioned, over any that have previously been built, are, that the cost of building it will be much less; that a more uniform and constant stream of water may be forced out; that the friction is so much less, and the machinery so simple, that it is believed that not more than half the power necessary to work an engine upon the old plan, will be requisite for this; and, finally, that it will be much less liable to get out of repair than any that have been made upon different principles."

It would have been more satisfactory had the patentee told us for what, in particular, he takes his patent; we suppose, however, that it is for the *application* of one cylinder as a double forcing pump, to the fire engine, as in the principle of the pump there is nothing of novelty.

We are compelled to dissent from most of the conclusions at which the patentee has arrived; we cannot conceive that a pump with eight valves is more simple, or less liable to get out of order, than one with four, or that pistons which are to work water tight through stuffing boxes, will require as little attention as those with open cylinders. We are also of opinion that the engine must cost more than the ordinary double chamber engine; and a *more* uniform and constant stream of water than is thrown by a well made fire engine of the usual construction is scarcely possible, and certainly impossible without an air vessel.

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38. For an *Axletree* for wheel carriages of all descriptions; Rezin Haslup, Baltimore, Maryland, February 24.

The axle is to be divided into two parts, and is to run in collars upon the carriage, instead of in boxes in the wheels. The end of the axle which enters the wheel is to be square, and fixed permanently in it.

There is no claim, and axles have, in many instances, been fixed in this manner; what there is of novelty in the proposed mode of doing it, we are unable to discover. In Eastman and Rix's wheel, mentioned at p. 252, the axles are so fixed.

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39. For a composition of matter to be used in the art of *House, Coach, and other Painting;* Chandler Metcalf, Hanover, Grafton county, Maine, February 25.

"The compound, or composition of matter, is to be used in mixing paints and putty. Take one gallon of common soft soap, or a

sufficient quantity of bar or brown soap to make a gallon of soft soap, add six gallons of rain or river water, having previously dissolved in the water one ounce of sugar of lead to every gallon of water; mix these ingredients well together; then add, for outside painting, six gallons of raw unadulterated linseed oil; or a less quantity of oil will answer for old buildings, and rough kinds of work. With this composition mix, or combine, paints formed from or combined with lead, as well as all other paints or colouring substances used in painting. The paints to be ground, mixed, and laid on in the same way and manner as when mixed with clear oil, as has been heretofore practised. For painting oil cloth, coaches, signs, insides of houses, &c. where the paint is required to dry expeditiously; instead of using all raw oil, as above, use a part, or all, of boiled oil; in all cases thinning the paint with the above composition, or spirits of turpentine."

The foregoing is the whole of the descriptive part of the specification. What benefit the soap is to produce we are not told, but its effect, undoubtedly, must be to render the paint less durable, or more readily acted upon by water. We see no difference between mixing soap with the oil, or adding to it a portion of caustic potash, which should convert a part of it into soap, and thus render it miscible with water.

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40. For an improvement in *Mortise Door Fastenings;* Leonard Foster, Boston, Massachusetts, February 25.

This is to be a substitute for the common mortise lock; but it is to be so constructed as not to occupy more than half the width, or thickness, usually required for such locks; adapting it, therefore, to thinner doors, and weakening the door much less than ordinary.

The bolt is to be shot forward either by a turning or sliding knob, which projects through the escutcheons. The escutcheons are to be made of metal plates, three inches square, and as the body of the lock is but two inches, the screws by which these are fastened enter the solid parts of the door, above and below the lock. On the inside of the door there is a small bolt which enters the main bolt, and secures it in its place. When it is desired to have the door to lock on the outside, a small lock, like those used for drawers, is fixed under the bolt of the mortise lock, which has a notch in it to receive the bolt of the small lock. The advantage, thus obtained, is the carrying of a small key instead of a large one. To enable the bolt to spring back as the door closes, the plate on the door post is made to slope, the thickness of the bolt itself not being sufficient for that purpose.

The claims are to the construction and arrangement of the various parts of the door fastening.

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41. For improvements in the *Printing Press;* Amos Sherman, city of New York, February 26.

The cheeks and cross timbers of this press resemble those in com-

mon use. The platten is worked by a toggle joint, and borne up by spiral springs in the manner of many of the modern presses. The handle, or lever, is fixed upon the middle of the near cheek, and when the platten is raised, its position is nearly vertical. The pull is downwards, which the patentee says is the most advantageous way of working. There is a mortise made through the cheek, through which a rule joint passes, and upon this the lever acts, which operates upon the toggle joint.

The press is double, having a form, inking apparatus, frisket, and other appendages on each side of the platten. There is a rounce also on each side, as it is intended to employ two men to work the press, and two girls to attend to the sheets. The two parts are connected by iron bars, which can be removed, and the press worked as a single press, when desired. The claims are in the following words.

"First, I claim that part of the press as I have described it, forming a single combination; its main parts consisting of the bar handle, the two upright pieces, and the two horizontal pieces. I do not claim the bar handle, nor either of the four pieces abstractedly, but I claim the bar handle as used by me in its upright position, that position being the easiest for working. I claim the bar handle and near horizontal piece as united by me by the joint; regard being had to their relative situations and the purpose they serve. I claim the two upright pieces and farther horizontal piece, as they are moved by the near horizontal piece, and as the further horizontal piece is united to the near horizontal piece. I do not claim the toggle joint abstractedly, but I claim it as constructed and moved in the peculiar manner I have described it, with the horizontal piece between the two upright bars.

"Second. I claim the cylinder for winding up the blanket, not abstractedly, but for this purpose, and also for drawing out the frisket. I claim the roller with its bellying form, inserted in the cylinder, and the channel in which it revolves, and the union of the roller and cylinder for the purposes which they serve. I claim the blanket, not abstractedly, but as made in one piece, and placed as I have described it, held at one end by the rollers, and at the other by the lath. I claim the lath with its bellying edge, for the purpose of holding and straightening the blanket. I claim the guides of the lath for the purpose which they serve in being forced towards the platten by the frisket guides, and forcing the frisket guides from the platten. I claim the hooks on the corners of the bed, the guides on the corners of the frisket, and the ways containing channels in which the rollers run, as I have described them, and for the respective purposes which they answer in carrying in the frisket and blanket. I claim also the ways containing grooves in which the guides of the lath and frisket run for that purpose.

"Third. I claim the union of two beds in one press, pressed alternately by a single platten; and the union generally of the two halves of the press, for the purposes for which they are united. I claim

the bar uniting the two beds, and the arrangement of the tail irons between the beds, to prevent the tail irons from interfering.

"Every other part of the press described above, except what I have thus claimed as my own invention, is not mine; but I declare the same to be old, and known before this my application."

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42. For improvements in the *Steam Engine;* Hugh Gordon, city of New York, an alien, but having resided two years in the United States, February 27.

The steam engine of which this purports to be an improvement, is the vibrating engine working upon trunnions on the centre of the cylinder.

The patentee says, "the only parts and combination of parts of the above described engine which I claim as my improvements, are the following, namely, the double packed joint aforesaid, and the combining the vibrating engine with the double steam chest and slide valves, together with the opening and shutting of the steam passages by forming a connexion between the valve rod, and a detached standard at rest, by means of connecting rods, a forked lever, and a moveable standard."

Accompanying the specification are ten distinct and well drawn figures, explaining the particular arrangements adopted by the patentee; as these are all things of mere detail, they cannot be explained without engravings.

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43. For an improved *Pendulum Churn;* Caleb Angevine, city of New York, February 28.

The churn is the common dasher churn, the rod of which is to be worked up and down by a pendulum. A frame is to be made, across the upper part of which there is to be a shaft turning upon gudgeons; from this hangs a weighted pendulum. The shaft is crossed by a lever, one end of which is attached to the dasher rod; from the other a pitman descends to a treadle. The pendulum may be made to vibrate by the hand; or the foot may be placed upon the treadle for the same purpose. The claim is to "the application of the pendulum principle to the dasher, which equalises the power applied, and assists in passing the reacting points in the rise and fall of the dasher; and also in the application of the foot power, which relieves the arms and chest in the act of churning."

We apprehend that this machinery would be improved by removing the frame, the shaft, the pendulum, the pitman, and the treadle, and taking hold of the dasher by the hands, as dairy maids have been in the practice of doing from time immemorial.

Specifications of American Patents.

***Specification of a patent for a Machine for Impelling Saw Mills and other works by water, called Strode's Reaction Wheel. Granted to* Joseph C. Strode, *Teacher, East Bradford, Chester county, Pennsylvania, February* 8, 1831.**

There is a wooden shaft seven feet six inches long, sixteen inches in diameter at the larger end, and fourteen at the smaller; in the centre of this shaft, is made a round hole eight inches in diameter at the larger end, and six at the other; the area of this hole will vary directly as the power required, and inversely as the subduplicate ratio of the height of the head above the centre of the shaft.—*a*, *a*, *a*, *a*, are six hollow arms, six inches in diameter, set perpendicularly in the shaft, A, at equal angular and linear distances, forming a true spiral curve from one end to the other. The holes through these arms are three and a half inches in diameter. Near the end of each arm is a hole one and three-quarters inch in diameter, so situated that the axis of the shaft, A, is perpendicular to the plane passing through the axis of the hole and that of the arm, and so that a plane passing through the axis of the hole perpendicular to the aforesaid plane, shall be a tangent to the circle formed by the middle point in the axis of the hole, by the revolution of the machine on its axis. The distance of the centre of this hole from the centre of the shaft, is thirty-three inches, and will vary directly as the power required and the subduplicate ratio of the height of the head above the centre of the shaft, A, and inversely as the number of revolutions desired. The area of the hole will vary inversely as the subduplicate ratio of the height of the head, and directly as the power required. The distance between each two of the planes passing through the axis of the arms to which the axis of the shaft, A, is perpendicular, is eleven inches, and will not answer to be nearer, because the water from each arm nearer the larger end would impinge against the back of the next arm, and thereby impede its motion; so that if the number of arms be increased, the length of the shaft must be increased in proportion.

The arms are made fast in the shaft by means of a tennon with a dovetail, as represented by figure H, the side of the tennon on which the dovetail is made is rather narrower than the opposite side, and the mortise in the shaft is of the same shape, so that when the wedge, I, is driven in on the side opposite to the dovetail, it will be firm and tight on all sides.

B, is a hollow cylinder eight inches in length with a rim on one end, one inch and a quarter wide, and three-quarters of an inch thick. The diameter of the hole is eight inches, the same as that in the shaft A. Its diameter from out to out is nine inches and a half, half its length; the other half, or the part *h*, is nine inches and a quarter at the shoulder where *g* terminates, tapering to the end, where it is nine inches. This cylinder is let through the plank,

D, of the trunk, which is three inches thick, with its rim on the inside, which is sunk in the plank three-quarters of an inch deep, or so as to face with the inside of the plank. It is made at the same time firm and water tight by means of eight screw bolts, each three inches and a half long, driven in from the outside through holes made in the rim, where it is screwed up firmly and rendered tight by means of burs. The part *h*, is four inches in length, and goes into the cylinder, F, which is of the same length, and is made fast in the shaft. It has four wings to keep it from turning. This cylinder is of such a capacity that it will work easily on the part *h*, and at the same time not allow too much play. G, is a lead washer one inch and a quarter wide, three-eighths of an inch thick, and its inner diameter eight inches. This washer and an iron follower of the same dimensions, are screwed against the ends of *h* and F,'(which are turned so as to face exactly,) by means of eight screws going through them and securing into the end of *h*. This is in order to render them water tight.

B, is a cast iron friction wheel, fourteen inches in diameter, running with its periphery, which is turned true, against the iron band F, on the shaft, (the band being also turned,) thereby supporting the weight of the shaft, A, to prevent too much friction on the gudgeon, *h*, of figure E. The gudgeons of the friction wheel run on the middle of the two cross pieces, *d* and *e*, made of wood, which are supported by the upright pieces, *b*, *b*, of plank, two inches thick, spiked at the bottom to the sill, C, and made firm at the top by the inch board, *c*, going across from one to the other and nailed to each.

In the foregoing description are given the dimensions of a machine now in operation, for impelling a saw mill under a head of twenty feet. If a larger or smaller wheel is required, the dimensions of the several parts will vary according to the proportions given.

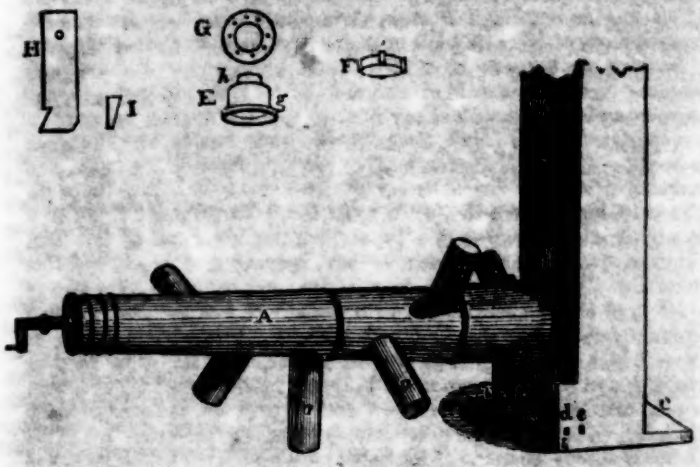
Some additional power may be obtained by the application of a funnel to each of the holes in the ends of the arms, *a*, *a*, *a*, *a*, &c. the small end of the funnel being applied to the hole, and the wide end standing outward. These funnels may be of small blocks of wood with a hole bored through the middle of each, and hollowed on the inferior side so as to fit the arms to which they may be attached, firmly, by nails or screws. The holes in the blocks should correspond in capacity and position on the inferior sides with the holes in the arms, and should gradually widen in the true funnel shape towards the outer surface of the blocks. These funnels may, or may not, be attached, at the option of the constructor; the machine will operate very well without them, though it is believed, from experiment, with some increase of power with them.

If a reciprocating motion is desired it may be obtained by means of a crank on the axle of the shaft A. In the machine above described the crank is at the end of the axle: but if the axle a little prolonged, be made to work on a point fixed in a permanent block placed directly opposite the smaller extremity of the shaft, and in the intermediate space between the end of the shaft and the block, the axle be so shaped as to form a crank, by which the reciprocating

movement may be given, there will be less friction and consequently a gain of power.

JOSEPH C. STRODE.

Strode's Reaction Wheel.



Specification of a patent for a mode of constructing Flues, or Stoves, for the Curing or Drying of Tobacco. Granted to DAVID G. TUCK, *Halifax Court House, Virginia, February* 15, 1831.

To all to whom these presents shall come:—Be it known, that I, David G. Tuck, have invented, or discovered, a new and useful improvement in the construction of flues, or stoves, for the curing or drying of tobacco, by which the whole or greater part of the smoke, as may be preferred, is excluded, and the expenses consequent upon the process very much diminished; and that the following is a full and exact description thereof.

The material of which I usually construct the said flues or stoves, is common brick, as, under most circumstances, it is more readily obtained, and is less costly than any other. They, however, may be made of stone, iron, fire brick, slabs, or tiles, made and baked in the manner of brick, or of other materials.

The dimensions of my said flues, or stoves, must be varied to suit the size of the barn, or drying house, in which they are to be used; and they will also admit of considerable variation in this particular in houses of any size, whilst the principle of construction may yet be retained. For the sake of description, I assume certain dimensions, which I have found to answer the intention perfectly, but do not intend to establish any limit in this particular.

These stoves, or flues, are to be so constructed that they may be

supplied with fuel from the outside of the house, and that the smoke, and other vapours from the fire, which it may be desirable to exclude from the interior of the building, shall, after passing through the larger flue, or stove, in which the fire is contained, to a spot near the centre of the building, return through a second, but smaller flue, which may be parallel to, and in contact with that first named, and be delivered, or have its exit, near the opening for feeding the fire.

Suppose my barn to be twenty feet square, and of the ordinary height. Near the middle of one end, or side, of the barn, I make an opening for the mouth of my flue, or stove; this flue, or stove, is a square, or arched trunk, about 30 inches in width, and the same in height. It is built horizontally upon the floor of the barn, and extends within it to the distance of about seven feet from the wall. The outer end, where the fire is to be fed, is furnished with an iron door of about a foot square. To receive the inner end of this flue, a square, or other formed pen, or box, is erected of brick, or other materials. This pen, or box, may be four feet in length, and two in width, and of the same height with the larger flue, or stove, which terminates in it. It should stand at right angles with the flue, or stove, which is to enter it on one of its broad sides. The smaller flue, through which the smoke is to return, also opens into this box, or pen, alongside of the large flue, and may return, and pass through the building, in the vicinity of the fire place, or feeding door. This second flue may be made of the same materials with the former, but need not be more than one-fourth of its size. From the end of it, a flue, or pipe, is erected perpendicularly to the height of four or five feet, to serve as a chimney to furnish a draft, and carry off the smoke. The interior diameter of this chimney need not exceed seven or eight inches; and an iron plate, or some other flat article, must be provided to stop the draught when required, by being placed upon the top of said flue.

It is manifest that in a structure of this kind, a fire may be made, and that the smoke will pass out at the chimney; but as soon as the wood is charred, and the fire burns clear, it is intended to admit the heated air into the barn, and to stop the draught through the flue, or chimney. For the purpose of admitting the heated air, the pen, or box, before described, is provided with an iron, or other door, or stopper, opening from it into the barn. This door may be twenty inches square; it may be fixed by hinges, or otherwise, so that it may be opened as soon as the smoke has ceased to escape from the chimney, and at this time the top of the chimney may have its cover placed so as entirely, or partially, to stop the draught through it.

A second flue, or stove, constructed exactly like the one just described, with all its appurtenances, is to be erected on the opposite side of the barn. The pens, or boxes, forming the termination of each of these flues, or stoves, will thus leave a passage of about two feet between them, on the centre of the floor.

These flues, or stoves, may be used either separately or conjointly; it will be found best, however, always to make a fire in each, as

there will then be no interval in which the heated air from the fire may not be admitted directly into the barn.

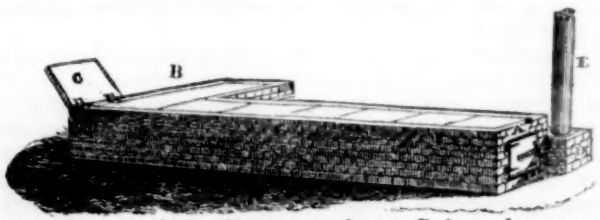
The manner in which the heat may be regularly distributed, and applied to the curing of tobacco, is fully described in the specification of a patent for a new mode of curing tobacco, which was granted unto me on the 1st day of October, 1830. To the system, or mode of procedure therein described, these flues and stoves are particularly adapted, but they may also be used when tobacco is cured in the ordinary way.

Where flues are carried directly through a barn, or drying house, the draft cannot be advantageously managed, and most of the heat is lost; a difficulty completely obviated by flues, or stoves, constructed upon the principle above described.

What I claim as my invention, or discovery, is the application of flues, or stoves, constructed upon the within described principle, by which the heated air from the fuel may be admitted, directly, into a barn, or drying house, for the purpose of drying and curing of tobacco, whilst the smoke may be entirely excluded. I also claim the returning of the draft of the flue, or stove, to a point, at or near to the feeding door of the stove, by means of which the draft of the fire is readily and perfectly managed, so as to produce great economy in the use of the fuel.

The escape flue, however, may be carried out at any part of the building, although not with equal advantage. It may, for example, be carried directly through the house, and yet the main object of my patent, that of admitting the heated air without the smoke, may still be attained. D. G. TUCK.

D. G. Tuck's Stoves or Flues.



A, the stove for fuel. B, pen, or box. C, iron door, opening into the barn. D, return flue for smoke. E, pipe, or flue, to carry it off.

Specification of a patent for an improvement in the construction of a Bucket Water Wheel, used for the purpose of giving motion to hydraulic works, or machinery. Granted to DEAN SAMUEL HOWARD. *Lyonsdale, Brantingham Township, Lewis county, New York, February* 16.

A COMMON bucket water wheel is well known to be a series of buckets suspended at the end of a certain number of arms passing

through a shaft hung up at each end by gudgeons, or pivots. The inside of these buckets is formed by the lining of the wheel; the bottom is a narrow board varying in width with the size and proportion of the wheel, with one edge jointed to the lining, and the other edge extending directly from the centre towards the circumference until it meets the front, which inclines from the circumference inwards on a straight line in a sectional direction till it meets the bottom, which forms the bucket.

Section of a part of Howard's Bucket Wheel.

The improvements thereon are as follows:

The bucket is detached from the lining of the wheel, so that the air has free access from one bucket to the other all around the wheel; the front is a board warped, or bent, in such a manner as to take and retain more water, longer than the common wheel; the front is wider than the back, so that all the surplus water must escape over the back, and none be thrown out by the centrifugal force. All the surplus water is directed into the bucket below, (which will hold more as the wheel turns,) by a board for that purpose forming the lining to the wheel and extending down by the back of the bucket. If thought necessary, the air might have access through the lining to each bucket.

D. HOWARD.

Specification of a patent for an improvement in the construction of Steam Boilers. Granted to LEVI DISBROW, *city of New York, February* 18, 1831.

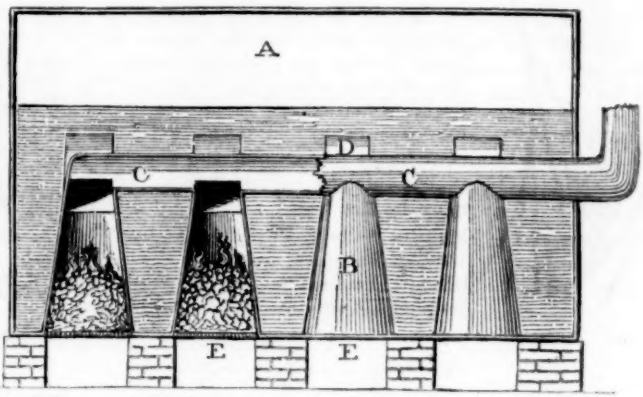
THE object of this invention is the advantageous application of anthracite, or other, coal, to the purposes of heating water in the boilers of steam engines. The boiler may be made of cast iron or any other usual materials, of any dimensions adapted to the purpose. The water contained in the boiler is heated by means of two, or more, furnaces of a conical (or other) form, erected within the boiler, having their bases, or the grates through which the ashes fall, upon or near the same level with the floor of the boiler. The smoke or gas is discharged from the top of the furnaces, by one or more horizontal cylinders passing through the boiler to its outer surface. Each furnace is replenished with coal by means of a pipe or feeder of a cylindrical or other convenient form, passing from the outer surface of the boiler through the same into each furnace at, or near, its top. Each of such pipes is secured by a door, or other means, at the surface of the boiler, and fixed to the furnace with a flanch or other suitable connexion; and the horizontal cylinders above mentioned

are also secured to the top of each furnace with a suitable flanch or connexion.

The said Levi Disbrow claims as his invention the advantageous application of heat to the boilers of steam engines, by means of two, or more, furnaces for anthracite, or other coal, erected within the boiler itself; and as parts of the same invention, he claims the mode of supplying such furnaces with feeders passing into them from the surface of the boiler, and also the mode of discharging the gas or smoke of the coal by a cylindrical pipe, or pipes, extending from the top of each furnace to the outer surface of the boiler.

LEVI DISBROW.

Disbrow's Steam Boilers.



A, boiler. B, B, furnaces. C, C, pipes for smoke. D, D, feeders. E, E, grates.

Specification of a patent for an improvement in the apparatus for Distilling. Granted to CHARLES OTIS, *Tunkhannock, Luzerne county, Pennsylvania, February* 16, 1831.

To all whom it may concern, be it known, that I, Charles Otis, have made an improvement in the apparatus used for distilling, and that the following is a full and exact description of the same.

The still may be constructed in the ordinary manner. A tube is to lead from the beak of the still into a tub, or vessel, which contains low wines. The top of the tub is made to fit steam tight, and the before mentioned tube passes through it, being also so closely fitted as to prevent the escape of any vapour around it, and extending nearly to the bottom of the vessel. The vapour from the beer which is contained in the still, will thus pass into the vessel containing the low wines, and cause the liquid to boil.

A tube leads from the upper part of the vessel of low wines, into a second tub containing a still worm, and called the heater. This

heater is to be filled with the beer with which the still is to be charged. This beer becomes heated in consequence of the partial condensation of the vapour, in its passage through the worm. This heater is to be elevated, so that a tube inserted near the bottom of it may convey the heated beer into the still, when it is ready for a charge. From the worm in the heater the spirit is conducted through a cooler, in the usual way.

By this arrangement of the distilling apparatus, the low are converted into high wines, by the operation of the vapour of the beer contained in the still.

I usually insert the still in a second vessel, so as to distil by a water bath; in this case I economize heat by conducting the steam from the second, or outer vessel, by means of tubes, so as to heat a second still, or to aid in performing other operations in the still-house, to which it may be applicable. Sometimes I convey the steam through a tube, provided with a cock, from the outer vessel into the still. This, however, I do not claim as making any part of my invention.

What I claim as new, and for which I ask a patent, is the conducting the vapour from the first distillation of the beer, into a vessel containing low wines, in the manner, and for the purposes hereinbefore described.

CHAS. OTIS.

Note by the Editor.—We do not perceive the difference between the plan here specified, and that of William Cook, which will be found in Vol. 5, p. 157. That patent was issued in December, 1829.

Specification of a patent for an improvement in the Manufacture of Gas for illuminating purposes. Granted to JOSEPH BARTON, *city of New York, an alien, but a resident in the United States for two years, February* 11, 1831.

BE it known, that I, Joseph Barton, have discovered a new and useful improvement in the manufacturing of gas, for illuminating purposes, and of a portable nature, and that the following articles are used as a combination to produce said gas without smell, viz.

Tallow, spirits of turpentine and rosin fused together, and decomposed through red hot tubes.

Turpentine and alcohol, do. do.
Coal tar and rosin, do. do.
Coal tar and tallow, do. do.
Coal tar, tallow, and rosin, do. do.
Seneca oil, coal tar, tallow, and rosin, do. do.
India rubber and Hydro carbons, do. do.
Oil of turpentine and rosin, do. do.

The foregoing substances contain gaseous matter, which when mingled with the pure illuminating principle, diminish its intensity,

and increase its bulk. The application of the combinations heretofore enumerated, is to unite two or more of these hydro-carbons, and decompose the mixture so as to form a compound on which chemical agents will act so as to separate the deteriorating from the beneficial, viz. spirits of turpentine by its decomposition furnishes the pure illuminating principle, (Carburetted Hydrogen,) mingled with free hydrogen, and carbonic oxide gases, both destitute of illuminating principle or properties, but with the addition of a small portion of rosin previous to decomposition, the carbonic oxide is converted into carbonic acid, which may be entirely removed by washing with an alkaline or earthy lixivium, and if to this a small portion of tallow, or oil, be added, it will have the effect of converting the free hydrogen which the mixture still contains, into pure carburetted hydrogen, which will be perfectly free from smell or smoke. If alcohol be added to turpentine, and the gaseous mixture resulting from its decomposition be passed through an alkaline lixivium, and thus purified from carbonic acid and other deteriorating gases, the gas thus produced will be the pure illuminating principle, which when compressed by a peculiar process into copper recipients with valves, may be made portable and applied to all uses where light is essential.

The method of making illuminating gases by a union of two or more vegetable, animal, or mineral hydro-carbons has never before been suggested or acted upon.

JOSEPH BARTON.

Remarks by the Editor.—We were placed upon tiptoe, some months since, by the announcement in the New York papers, that a chemist of that city, Mr. Barton, had made some important discoveries in the making and using of gas, for illumination, and if we had not learned from experience to chasten our anticipations, the result would have been sore disappointment. There is not a single fact, or principle, noticed in the foregoing specification, with which every chemist was not perfectly familiar, and therefore there is not a point in it which can lay the slightest claim to discovery.

We are first told that the gas is "of a portable nature." What does this mean? How much more portable is it than the gas from oil, or from rosin, made at the New York gas works? If the patentee supposes, as he evidently does, for he makes it the very foundation of his claim, that two or more oleaginous, bituminous, or resinous substances have never been mixed together for the manufacturing of gas, he has but little knowledge of the history of that art. The name of *hydro-carbons* with which he labels these different articles, has not been enlisted into the ranks of the chemical nomenclature, and, we apprehend, will not be received as a volunteer. The last article upon the list of compounds to be used is scarcely made with a view to economy. The chemist would not wish to convert turpentine into rosin and spirits, for the sake of combining them together again, for the manufacture of gas. It appears, however, according to the chemistry of this specification, that rosin is to be added to

spirits of turpentine in order to convert oxide of carbon into carbonic acid. We wish very much to see the rationale of this process, as, according to our philosophy, carbonic acid would be more likely to become oxide of carbon, by heating it in company with rosin, than the oxide of carbon to undergo the change above designated.

As regards the rendering the gas portable, the information given, is most meager, or rather there is no information whatever afforded; as the portable gas company of London knew, before they commenced their operations, that gas "when compressed by a peculiar process, into copper recipients, with valves, may be made portable, and applied to all uses where light is essential."

Specification of a patent for an improvement in Carriages and Wagons intended to travel upon Rail-roads. Granted to WILLIAM HOWARD, *Esq. Civil Engineer, Baltimore, Maryland, April* 23, 1831. (*With a Copperplate.*)

BE it known, that I, Wm. Howard, of the city of Baltimore, and state of Maryland, have invented a new and useful improvement in carriages and wagons intended to travel upon rail-roads, by means of which the flanches of the carriage or wagon wheels, are prevented from impinging on the rails, when these last vary from a right line in their direction, or, in other words, when there happen to be curves in the location of the rail-road, so that the friction of the flanch against such curved rail, is entirely saved; or, if the flanch should occasionally touch the rails, is so much reduced as to afford no material additional resistance. The contrivance, mode, or invention, by which this most desirable result is obtained, is specified in the following words, which contain a full and exact description of the construction and operation of the said machine as improved by me; and which is also illustrated by the accompanying drawing, which is made a part of this specification.

I employ two wheels, placed at a convenient distance in front of the carriage, or wagon, which I call *governor wheels*, and whose axis of rotation is always kept parallel to the axis of the fore wheels by a frame constructed for the purpose. Each of these wheels is composed of two parts, acting separately and distinct from each other—that is to say—the flanch, and the tread, or bearing part of the wheel. The bearing part of the governor wheel is made to revolve upon the axle, while the flanch is made fast to the same axle. The axle of the governor wheel is divided into two parts, on the inner ends of each of which is placed a bevel cog wheel, which two bevel cog wheels work into a third, placed on the side next the fore axle of the wagon wheels, and parallel to it; so that while one half of the governor wheel axle turns one way, the other half turns in the opposite direction. The three bevel wheels here mentioned are supported in a convenient frame, which also keeps the two parts of the governor wheel axle revolving on the same right line; all which is represented in Fig. 3. of the drawing. The centre bevel wheel,

which effects a change of direction in the opposite parts of the governor wheel axle, moves upon an axle, which extends to, and under, the fore axle of the wagon wheels, and on the end of which is an endless screw. This screw works the end of one arm of a horizontal lever provided with teeth for the purpose, whose fulcrum is in a frame under the axle of the fore wheels and near one of the hubs, and whose other arm, which is bent horizontally at right angles with the first, is connected with and acts upon a horizontal bar, or arm, fastened to the axle of the hind wheels, as represented in figures *one* and *two* of the drawing. The wheels of the wagon revolve upon their respective axles, and the fore and hind axles, besides the usual coupling bar, are so connected, as that the axles may always be in the position of the radii of the curve on which they may be moving, according to the specification, or on the principle, of a patent heretofore obtained by me, for an improvement in rail-way carriages.

Now it is plainly to be seen that the carriage, or wagon, with its governor wheel, when travelling on a straight rail-way, will not have the flanches of any of the wheels to impinge against the rails. On arriving at a curve, however, the flanch of the governor wheel immediately comes in contact with the outer rail, and the friction there, causes it to turn round, together with the bevel wheel attached to it. The second, or intermediate, bevel wheel, is then set in motion, and the endless screw at the end of its axle, moves the lever that is connected with the bar from the hind axle; which, of course, changes the direction of that axle, and in so doing changes also, by the peculiar coupling aforesaid, the direction of the fore axle; and both the fore and hind axles are thus, by the friction of the flanch of the goveenor wheel upon the rail, brought into the position of radii of the curve upon which the carriage, or wagon, is then travelling, without the flanches of the main wagon or carriage wheels coming in contact with the rails.

The invention and improvement here specified may be applied at once to the fore wheels of the carriage, or wagon; which would then be governor wheels in their construction and mode of operation.

What I claim as new, and as my own invention and discovery, in the above described machine, and for the use of which I ask an exclusive privilege, is the separation and distinct action of the flanch, and the tread or bearing part of wheels to be used on rail-roads; and I also claim as my own, and as new and original, the particular combination by which the effect is produced, as described, and set forth in the above specification.

WM. HOWARD.

Explanation of the Drawing.

Figure 1, represents a side view of the carriage. In this, every part of the carriage that is not peculiar to the present invention, and which would interfere with its representation, is omitted.

Figure 2, is a plan of the carriage. In this, the main coupling bar between the axles, seen in Fig. 1, is omitted; and the fore axle is

Howards
Self directing
Railway Carriage
1831

Fig. 1

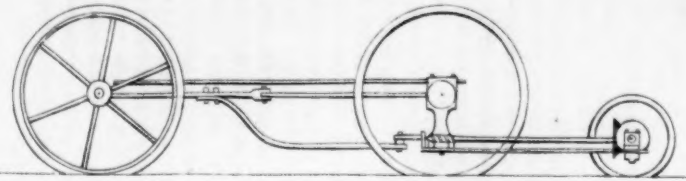


Fig. 2

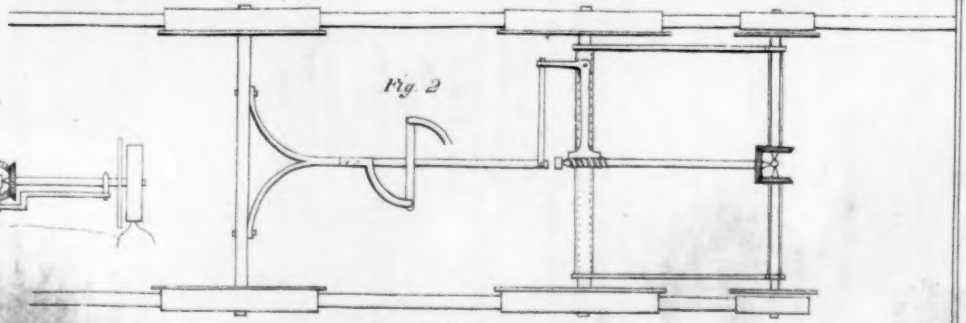
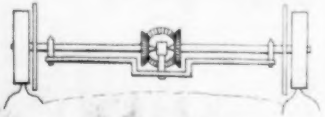


Fig. 3



represented by the dotted line. This arrangement permits the endless screw and the levers that effect a change in the direction of the axles, to be seen.

Figure 3, is a front view of the governor wheels, showing the manner in which the axle is divided, the bevel wheels, and the separation of the flanch and tread of the governor wheels.

ENGLISH PATENTS.

Specification of a Patent granted to CHARLES DEROSNE, *of Leicester Square, in the county of Middlesex, Gentleman, for certain improvements in extracting Sugar or Sirop from Cane-Juice and other substances.—Dated 29th Nov.* 1830.

To all whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Charles Derosne, do hereby describe the manner in which the said invention is to be performed, by the following description thereof, (that is to say:)—

The invention consists in a means of discolouring sirops of every description, by means of charcoal produced by the distillation of bituminous schistus alone, or mixed with animal charcoal, and even of animal charcoal alone. Whatever sort of charcoal it may be, it must be disposed on beds very thick, on a filter of any suitable form. The filter of itself has nothing particular, and does not form the object of the patent, because it is already known and used for other purposes, but till now it has not been employed for discolouring sirops. To obtain this discolouration, I put the charcoal in a case, in which I place at a distance of about an inch from the bottom a metallic diaphragm pierced with a great number of holes; I then place upon this diaphragm a clear and coarse linen or woollen cloth, which exactly covers it; I then place upon this cloth a bed of charcoal of bituminous schistus alone, or mixed with animal charcoal, or animal charcoal alone. Whatever it may be, this charcoal ought to be in a state of division, in order that it may be well penetrated with the sirop which is intended to be filtered. Charcoal in fine powder would not be penetrated by the sirop. It has been found that the charcoal reduced to the size of fine gunpowder is very fit for this operation; if the grain is too large, the filtration would be operated too rapidly. I lightly press the charcoal, and then again place new beds of the same charcoal, which should likewise be pressed till it has come up to the height of fifteen or sixteen inches. It may be made higher if found necessary, or it may be less, but the discolouring effect will be always in proportion to the thickness of the bed of charcoal. When the charcoal is disposed to the proper thickness, it is to be covered with another metallic diaphragm, pierced likewise with holes, upon which is spread another clear linen cloth; it is upon this cloth on which is poured the sirop which is destined to be discoloured. The sirop ought then to form a bed of several inches

thick, from four to eight, although there is no precise rule. For operating well in the filtration of sirops, the sirop ought to be clear before pouring it upon the filter, and ought to have undergone a first filtration by the known means, the point to be obtained by the filtration through the thick beds of charcoal is only the discolouration of sirops. The sirop to be filtered ought not to pass over the consistence, which is produced by two-thirds of sugar and one-third of water; but it may be filtered at any less degree of consistency according to the result required. When the sirop is hot the filtration operates a great deal more rapidly. In operating on a great scale, a reservoir filled with sirop can furnish several filters at a time by means of cock-balls placed in each filter. The first portion of sirop which passes through the filter is always the most discoloured, and by the time the colouring part combines itself with the charcoal, the effect of the last portion becomes less sensible. The portion of sirops which preserves a part of its colour after its filtration, can be passed again upon another bed of charcoal in another filter, and by this means it may be obtained in a great degree of purification. Whatever the charcoal used, it is desirable to mix the charcoal with about one-sixth part of its weight of water before putting it in the filter. The place of that water is occupied by the sirop which penetrates the beds of charcoal, and then the water comes the first; it has a disagreeable and salted taste when the animal charcoal is used, the water after that comes mixed with a portion of sirop, and soon after it is displaced by the pure sirop.

When the charcoal has been deprived of its colouring effect, pour water on the filter for dissolving or displacing the sirop which is mixed with the charcoal, the sirop then comes pure first, and after that mixed with more or less water, using as little as possible of water, it is convenient to suspend occasionally the effusion of water on the upper part of the filter, and to shut its cock. The sirop being heavier than the water, gains the bottom of the filter, and runs first. The sirops made with raw sugar by this process can be made as clear as water. The molasses are deprived of their bad taste, and are converted into a good kind of sirop of a clear and yellow colour. The sirops from which it is desired to separate colouring matter can be obtained directly from the juice of cane, or of beet-root, or from the saccharine matter produced by the action of sulphuric acid upon the farinaceous matters before these juices or liquids have been baked for extracting the sugar. The sirop may likewise be produced by the solution of all kinds of sugar, and of the products of inferior quality, which are obtained in sugar refining under the name of "bastards," and other sugars. The purpose of producing of sirops may be to sell them in such a state for the ordinary consumption, or to bake them for making sugar whiter than is obtained by the common process, or these whitened sirops may be used for discolouring the refined sugar, in making them filter through the loaves for replacing the use of the earth and water. The object of the invention being to obtain discoloured sirops by the means above

described, this discolouration of sirops is always proportionate to their primitive colouration, and to the quantity of charcoal which is used. The carbonization of bituminous schistus has nothing particular; it is produced in close vessels, as is done for producing animal charcoal, only it is convenient, before the carbonization, to separate from the bituminous schistus the sulphurets of iron which are mixed with it. Instead of using the schistus, or animal charcoal of the size of gunpowder, it can be reduced to a powder still more fine, mixed with sand; in this state a given quantity of charcoal discolours better than powdered less fine, but the filtration is slower and more difficult to be regulated. After having tried this first method, I have given the preference to the other mode, but both of them are the object of the patent.

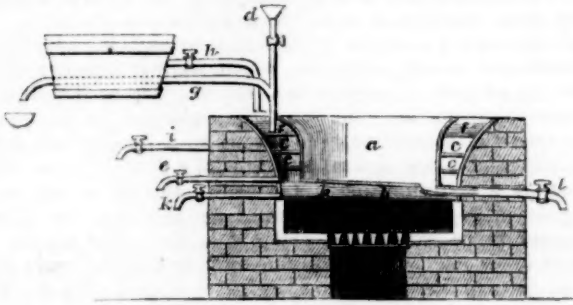
In witness whereof, &c.

Patent granted to WILLIAM SHAND, *of the Burn, in Kincardineshire, Esq. for certain improvements in evaporating Sugar.*

THE object of this invention is to evaporate sirop and other organic matters rapidly, without producing that carbonization or charring which invariably attends the direct application of fire to the evaporating vessel. Every colonial planter knows that rapidity of evaporation, at a moderate temperature, is highly conducive to the amelioration of the sugar, not only by preventing charring, which improves the quality, but also by increasing the quantity, more of the sirop being granulated, and less converted into molasses. The principle by which this object is effected, is by applying heat through the medium of a volatile substance, which, while it imparts sufficient heat for the purpose of evaporation, cannot char or discolour the matter to be evaporated. The substance employed for this purpose is oil or spirits of turpentine, which boils at a temperature not exceeding 320° Fah.; it is applied by means of a double copper vessel. as shown by a section through the centre thereof in the accompanying drawing: *a* is the evaporator for receiving the sirop or other liquid to be evaporated, and *b b* is the outer copper into which the inner one is fixed, leaving an intermediate space at the sides and bottom. Spirits of turpentine is poured into this space through the vertical tube and funnel, *d*, until it is in contact with the bottom only of the inner copper, any excess above this quantity being withdrawn by the trial cock, *e*. The object of this arrangement is, that the boiling oil may be directly applied to the *bottom* of the inner copper, while its vapour plays round its sides. It is essential that the hot oil should actually touch the bottom of the inner copper, since the heat communicated by the vapour alone is insufficient to maintain rapid ebullition, owing to the small quantity of latent heat which it contains, comparatively with that of aqueous vapour, the ratio being 175° to 960°; but provision must be made to prevent the escape of the vapour, or any portion of oil, and the mode of effecting this object, constitutes the peculiar advantage of this evapo-

rator. This arrangement consists in a channel, *c c c c*, which commences at a given height above the bottom of the inner copper, passes around its sides, and terminates under the water gutter, *f f*, the bottom of which completes the upper part of the channel. The vapour is thus made to circulate round the sides of the copper, giving out its heat to, and being partially condensed by, the evaporating liquid, and subsequently being completely condensed, by a supply of water introduced for that purpose into the water gutter, *f f*, above mentioned. Since by extending the lower surfaces of the water gutter over the vapours, any degree of controlling power may be exercised, there is no risk of the oleaginous vapour escaping beyond this point; but if additional security were required, it would be easy to apply a subsidiary condenser, by conducting the tube, *g*, which communicates with the circular channel, *c c c c*, through a trough, or other convenient vessel of water, placed near the side of the evaporator. The water of condensation is conveyed to the gutter, *f f*, by means of the pipe, *h*, and it is removed, when it becomes hot, through the pipe and stop-cock, *i*. The pipe and stop-cock, *k*, is for drawing off the oil when necessary, and a similar pipe and stop-cock, *l*, is intended to draw off the sirop from the evaporating vessel.

The foregoing explanation refers in particular to the manufacture of sugar, because it is conceived that its application to this branch of industry, both in our colonies and in refining, will be found the most important; but the principle is obviously applicable to other purposes, as, for example, in procuring a pure spirit by distillation.



Patent granted to JAMES COLLIER, *of Newman street, Oxford street, in the Parish of St. Mary-le-bone, Civil Engineer; and* HENRY PINKUS, *of Thayer street, Manchester Square, in the county of Middlesex, Gentleman, for an improved method and apparatus for generating Gas for Illumination.—Dated April 5*, 1830.

THE material from which the gas is to be generated consists of a proportion of one cwt. of rosin, pitch, or other bitumen, dissolved by the ordinary means, or a similar quantity of Stockholm or Arch-

angel tar, which, being heated to a temperature of from 150° to 200° of Fah., is mixed with five to seven per cent. by weight of sugar, molasses, or other similar combustible, affording an excess of carbon. The mixture is then to be agitated till all effervescence ceases, and is then ready to be used for producing gas in the way to be described.

A cylindrical retort, divided longitudinally into three compartments, is placed in a common coke furnace, its periphery resting on friction rollers affixed to the latter. A pipe or funnel proceeds horizontally from the back of the retort, and is furnished with an elbow and stuffing box, the former dripping into a hydraulic joint, and communicating with a condenser below it. Above the retort, and parallel with it, are three generators, composed of as many pipes, which unite in one before entering at the front of the retort, and furnished with proper feed cocks. A feeding valve and governor is connected with the condenser, and communicate with the supply cocks by means of a lever.

The patentees observe, that the surfaces of the compartments, on to which the heated material is to be injected, should be covered with fragments of bricks or coke. The retort being heated to a bright cherry red, the material may be passed into the generators by means of a force pump, or by a column of the fluid of convenient length, according to the required pressure necessary to keep the generators full. When the fluid has become sufficiently heated, vent must be given at the feed cock, when it will, by its expansive force, flash off into the retort in small streams or sprays, and will fall nearly equal over the red-hot surface, and will consequently be more effectually and quickly decomposed than by the common mode of letting the fluid fall on one part of the retort, which would soon become cooled down to a black heat, and cease to decompose the material, whilst the remaining part of the retort would frequently acquire so intense a heat as to deposite much carbon. The material having absorbed caloric in its passage through the generators, will require proportionably less heat to decompose it in the retort.

By the common method of using the resinous bitumen, much inconvenience has arisen owing to the detrimental effects produced on the metal of the retorts by the development of its oxygen, and the consequent formation of acids in the retort. To obviate these injurious effects, sugar or molasses, or other similar combustibles, affording an excess of carbon, is combined with the bitumen as before described. When this compound material is subjected to a red heat, and oxygen is developed, part of the latter will unite with the excess of carbon to form carbonic acid gas, (which may be removed by purification,) and a part will unite with hydrogen to form water, which will be deposited in the condenser, and may be separated from the resinous matter by decantation.

Another method is proposed for neutralizing such effects, and consists in admitting into the retort when in action, ammoniacal gas, or hydrogen gas in excess; part of the oxygen will then unite with the hydrogen gas, or hydrogen of the ammonia, and water will be deposited as before, some nitrogen from the ammonia will appear, the

metal of the retort will thus be preserved, and their power to decompose be less impaired.

The advantages contemplated in the adoption of the revolving retort for this purpose, are stated to be that, first, in a given capacity for generating, there is considerably less metal to be heated; secondly, much smaller ovens or furnaces will be required, and there will be consequently less radiating surface, a saving in fuel, and fewer condensing vessels required; but we do not confine ourselves to any particular form of retort.

The effects produced in fixed retorts, by oleaginous or carbonacious matter falling on and adhering to one surface, is of such a nature as to diminish the power to decompose and obstruct the absorption of heat; by returning the revolving retort on the friction rollers, fresh surfaces are presented to action, when the previous ones will have time in some measure to recover their former condition.

The advantages contemplated, by the combination of a feed valve with a compensating valve, or a common governor, is the regulating, by the latter, the supply of gas to the burners with more uniform pressure, and preventing the agitation or jumping of the lights caused by the sudden or unequal velocity of the gas issuing from the retort. As the gas issues from the retort it enters the feed valve, lifts one end of the lever, depresses the other, and shuts off the supply to the retort. As the gas becomes exhausted the feed valve becomes depressed, and the other end of the lever rises, opening the supply cock, when more heated material flashes into the retort.

The patentees claim as their improvement, first, the above described method of neutralizing the effects and inconveniences arising from the common manner of using the resinous bitumen, by adding to the bitumen molasses, sugar, or other similar material, which shall unite with the oxygen developed in the retort, and form compounds less detrimental; second, the means of effecting the same object by admitting into the retort, when in action, ammoniacal or hydrogen gases; third, injecting into the retort any material to be decomposed, whether by the action of a force pump, or by the expansibility of heated material; fourth, the method of heating in generators under pressure a material to be decomposed; fifth, the combination of a compensating valve or governor, in conjunction with a feed valve, but disclaiming them when uncombined or separate; and sixth, the application of a finishing purifier, when placed at the outlet valve as described.

Documents relating to the Royal Ordinances of France, (1823 and 1828,) *concerning High Pressure Steam Engines.*

[TRANSLATED FOR THIS JOURNAL.]

(Continued from page 327.)

Circular of the 16th of July, 1828, to the Prefects of Departments, on the subject of the Royal Ordinances, of the 29th of October, 1823, and the 17th of May, 1828, concerning High Pressure Steam Engines.

SIR,—On the 1st of April, 1824, and on the 19th of May, 1825, I had the honour of addressing to you two circulars, accompanied by instructions, relating to the execution of the ordinance of October 29th, 1823, (No. 637, of the Bulletin of Laws, p. 230,) concerning high pressure steam engines, or those in which the elastic force of the steam exceeds two atmospheres. The experience of four years and a half, showed the want of new regulations in relation to high pressure steam engines, and his majesty has issued a new ordinance on this subject, bearing date the 17th of May, last.

The same Board of Engineers of Mines, and of Civil Engineers, which I convened in 1823, to put in execution the ordinance of October 29th, of the same year, and which had prepared the two sets of instructions spoken of above, has drawn up a third set of instructions, for the execution of the ordinance of May 7th, 1828. These instructions were, at my instance, approved on the 12th of this month, by his excellency the Minister of the Interior.

I have the honour to transmit to you — copies of these instructions. They give, in the first place, the rules for the proof pressure to which boilers must be subjected: they point out, next, the manner in which boilers, as well as interior and exterior cylinders, must be proved; they further show the necessity of giving to boilers of rolled copper or iron, sufficient thicknesses, and the manner of determining these thicknesses, observing that much greater thicknesses in proportion to the diameter, should be given to boiler tubes, than to boilers proper; because, being surrounded by the fire, they are more exposed to oxidation. Lastly, the instructions are terminated by some details, as to the manner of proving boilers and boiler tubes.

You will find appended to these instructions: 1st, a table of thicknesses for boilers of rolled or hammered iron; 2nd, a formula and explanations, which relate to this table; 3d, formulæ relating to the proof of boilers, boiler tubes, cylinders and their jackets.

I am satisfied that the table and the formulæ will be found of easy application.

The last ordinance, that of the 7th of May, 1828, is placed at the end of the instructions.

Experiments are yet to be made, to determine exactly, the elastic force of steam at different temperatures, and the dimensions to be given to safety-valves, as well as to determine the value of new devices, which have been proposed, to insure safety; I shall communi-

cate to you the results of these delicate and important experiments, as soon as they are completed.

I must not conclude this communication without recommending again to your attention, and to the superintending care of the Engineers of Mines and Civil works, the operation of the steam engines in your department. These operations involve human life, as well as the prosperity of the mechanic arts; and as the minor details are of importance, and may escape the memory, I beg you, as well as the engineers, to refer to the circulars of the 1st of April, 1824, and the 19th of May, 1825, and to the instructions which accompany them; to examine, again, their contents, and to satisfy yourself that those instructions are conformed to. As a knowledge of the instructions, whch I now transmit to you, is indispensable to the manufacturers of boilers and of high pressure engines, I request you to send copies to both these classes of persons, so that they may profit by the information afforded them, and conform to the directions prescribed.

I hope, further, that you will attend to the execution of the ordinance of the 7th of May, 1828, and of the instructions which I now transmit to you, and request you to advise me of the receipt of the present communication.

I have the honour to be, &c. &c.

(Signed,) Becquey,

Counsellor of State, Director General of Civil Works and Mines.

Third Set of Instructions in relation to the execution of the Royal Ordinances of the 29th of October, 1823, *and 7th of May,* 1828, *concerning High Pressure Steam Engines.*

In conformity with the third article of the Royal Ordinance of October 29th, 1823, in relation to high pressure steam engines, the boiler of every engine of this kind must be subjected, in its proof, to a pressure equal to five times the usual working pressure of the engine. This proof pressure is reduced, by the Royal Ordinance of the 7th of May, 1828, to triple the usual working pressure, for boilers made of rolled copper or of wrought iron.

Cast iron boilers will still be required to bear the proof of a quintuple pressure.

This proof pressure has reference to the bursting pressure, which is evidently equal to that produced by the tension of the steam within, diminished by one atmosphere; since the boiler is pressed on the exterior by the atmosphere. This explains why the 4th art. of the Royal Ordinance of the 7th of May, 1828, directs that the tension of the steam under which the engine is ordinarily to work, diminished by one atmosphere, should be assumed as the unit of pressure.

According to the 2nd and 3d articles of the new ordinance, boiler tubes, as well as cylinders and their jackets, will be proved by a pressure referring to the same unit. This proof pressure will be quintuple

the ordinary pressure for generator-tubes and cylinders of cast iron, and only triple for those of copper or wrought iron.

The mark to be affixed, after proving, to boiler tubes and cylinders, will be regulated in the manner set forth, for boilers, in the second set of instructions, in reference to the ordinance of October 29th, 1823.

For example, suppose an engine to be run usually at a pressure of five atmospheres. The boiler, after proving, must be marked five atmospheres. The unit of pressure being five less one, or four atmospheres, this number is to be multiplied by five, if the boiler be of cast iron, or three, if of copper, or of wrought iron, to determine the proof pressure. Thus the mark five, will show that the boiler, if of cast iron, has been subjected to a proof pressure of twenty atmospheres; if of copper or wrought iron, to a proof of twelve atmospheres.

If the boiler be of cast iron, and the boiler tubes of copper, or wrought iron, these latter, although they have been subjected but to a triple pressure, are to be marked five, as well as the boiler which has borne a quintuple pressure.

Manufacturers should not be induced, by the less proof to which boilers of wrought iron, or of copper, will be subjected, to diminish the thickness now in use for such boilers. If any such diminution should be made, the consequences would be of the worst kind, and to prevent this, the first art. of the Royal Ordinance of the 7th of May, 1828, while it reduces the proof, requires such a thickness to be given to the boiler, that the resistance of the metal may not be diminished by the proof.

Experience has shown, that elastic substances, as iron or copper, cannot bear, without injury, a strain nearly equal to that producing their rupture. The same injury would occur, if boilers of those materials were too thin. It is, therefore, essential to give to a boiler such a thickness, as shall enable it to bear three times the pressure to which it is to be subjected, under the hydraulic press. If this were not the case, the proof might injure it, without, perhaps, producing any external appearances of rupture.

Manufacturers, therefore, should make their boilers too thick, rather than too thin, thus avoiding the risk of their giving way, after having stood the proof pressure.

It is proper to observe here, that the 7th article of the Royal Ordinance of October 29, 1823, requires the engineers to examine, at least once a year, every boiler; to ascertain the condition of each, and to induce the condemnation of those, which long use, or accidental deterioration, may have rendered, in their opinion, dangerous. The only means of proving a boiler, is to submit it, anew, to the action of the hydraulic press. It is, therefore, necessary that manufacturers should furnish boilers, which may, at any time, be proved without injury to them.

The thicknesses hitherto given to boilers of wrought iron, have been considered too small for the quintuple proof; they will, however, suit the triple one, and if such dimensions be preserved, boilers may be proved without injury to them.

The proper thickness for a boiler is to be determined, with relation, 1st. to the tenacity of the material to be used, allowing for the injuries to which it may be exposed; 2nd. to the diameter of the boiler; and 3d. to the bursting pressure which the boiler is to withstand. The mode of calculation is as follows: express in inches, and decimal parts of an inch, the interior diameter of the boiler, which is supposed cylindrical, with hemispherical ends, the only proper form for a high pressure boiler; multiply the diameter, thus expressed, by 18, and this product by the interior pressure (in atmospheres) less one; to this product add 1200, and divide the sum by 10,000, the quotient will give in decimal parts of an inch the thickness sought.

Let us suppose, for example, a boiler of which the interior diameter is 30 inches, and the pressure of the steam within, 5 atmospheres, required its thickness. Thirty, multiplied by 18, gives 540; this product multiplied by 5 less one, or 4, becomes 2160; 1200 added to this, gives, for a sum, 3360; this divided by 10,000, which is done by cutting off 4 figures for decimals, gives (.336) 336 thousandth parts of an inch for the thickness required. The thicknesses, given in the table annexed to the present set of instructions, were calculated in this way. It will afford the means of judging whether a boiler is thick enough to be subjected to the proof, the quality of the metal of which the boiler is made being considered separately. This table includes a variety of cases, and any thickness not found there, may be calculated by the method explained above—the formula for expressing which, will be found appended to the table.

High pressure boilers should never have a less thickness than .18 ($\frac{3}{16}$ths) of an inch; but while an insufficient thickness is to be guarded against, the opposite extreme, viz. giving too great a thickness, is equally to be avoided. Experience shows, that boilers, when very thick, are affected greatly by the action of the fire. Practical men give .56 ($\frac{9}{16}$ths) of an inch as the maximum thickness. This limit restricts the dimensions of boilers intended to supply very high steam; for example, the table appended to these instructions, shows that a boiler, bearing the stamp of eight atmospheres, cannot have a diameter greater than between 34 and 36 inches.

The preceding remarks show, that no boiler can be licensed, which is not of the thickness required by the number representing the pressure within, and by its diameter, even when such a thickness could not be given, without going beyond the prescribed *maximum*. In such a case, a mark of a lower grade must be affixed, and if the manufacturer require a boiler of the proof first intended, he must provide one of a less diameter. It must be observed, that the method, just given, for determining thicknesses, does not apply to boiler tubes. These tubes have a much greater proportional thickness given to them than to boilers, since, from their position, they are more exposed to deterioration.

If the boiler is to be made of laminated copper, the table, or formula, may still be used to determine its thickness. Manufacturers are not in the habit of giving to copper boilers thicknesses

greater than those of iron boilers, of the same diameters; because, although rolled iron is more tenacious than copper, the qualities of different sheets, and even of different parts of the same sheet, are very variable, which is not the case with copper. If, however, the copper is not of good quality, one or two-tenths of the thickness given by the table, should be added to the numbers there found, for the thickness of the boiler.

The present instructions may be usefully concluded by some details upon the method of proving boilers by the hydraulic press, or forcing pump.

In proving boilers, their safety-valves should be loaded with the requisite weights; in the case of boiler tubes or cylinders, the valve of the hydraulic press must be loaded.

The requisite weight will be found as follows:

Express in inches and decimal parts of an inch, the diameter of the valve; square this number, that is, multiply it by itself. Multiply this square by 1178, and divide the product by 100, the quotient will be the number of pounds, and decimals of a pound, with which the valve is to be loaded for each atmosphere. The weight, thus found, multiplied by the required number of atmospheres of pressure, will give the proof weight. As an example, take a valve of 1.5 inches in diameter. Squaring this number gives 2.25; multiplying the square by 1178, we have 2650.50; dividing this product by 100, (removing the decimal point two places to the left, gives 26.5050 lbs. for the load upon the valve, which will balance a bursting pressure of one atmosphere.

If the proof required is twelve atmospheres, the number just found should be multiplied by 12; if 20 atmospheres, by 20. Let us suppose the latter case, the valve must then be loaded with a weight of 530.1 lbs.

In order to apply this weight by the intervention of a lever, the number just found must be multiplied by the short arm* of the lever, and the product divided by the long arm, each being expressed in inches. For example, suppose the short arm of the lever to be 2 inches, the long arm 15 inches; 530.1 must, in such a case, be multiplied by 2, and the product divided by 15; this quotient, 70.68 lbs. is the weight to be applied at the end of the long arm of the lever. If the long arm were ten times the length of the short arm of the lever, the weight to be applied would be 53.01 lbs. one-tenth of the direct weight. Such a ratio has been adopted by the principal mechanicians of Paris; it shortens calculations: its adoption in all the manufactories of steam engines, and of hydraulic presses, is recommended.

The numerical operations, which have been described, are expressed by algebraic formulæ, in the appendix to these instructions.

In conclusion, it is to be observed, that before the proof is begun, the engineer should ascertain that the valves are well made, and carefully fitted.

When a valve is defective the water is forced out in particular

* The short arm of the lever, is the distance from its fulcrum to the point where the lever acts upon the valve; the long arm, the distance from the fulcrum to the point of application of the weight.

parts of the periphery, before the required pressure has been reached; there can be no certainty that the proof pressure has been applied, until the valve rising suddenly allows the water to escape at every point of its circumference.

Table of thicknesses to be given to Wrought Iron Boilers, for High Pressure Engines.

Diameters of Boilers.	Thicknesses in Decimals of an inch.						
	Working pressures in atmospheres.						
Inches.	2	3	4	5	6	7	8
20	.156	.192	.228	.264	.300	.336	.372
22	.160	.199	.239	.278	.318	.358	.397
24	.163	.206	.250	.293	.336	.379	.422
26	.167	.214	.260	.307	.354	.401	.448
28	.170	.221	.271	.322	.372	.422	.473
30	.174	.228	.282	.336	.390	.444	.498
32	.178	.235	.293	.350	.408	.466	.523
34	.181	.242	.304	.365	.426	.487	.548
36	.185	.250	.314	.379	.444	.509	.574
38	.188	.257	.325	.394	.462	.530	.599
40	.192	.264	.336	.408	.480	.552	.624

Formula and Explanatory Remarks referring to the foregoing Table.

The numbers in the first column of the table, are the diameters of the boilers expressed in inches. Above each succeeding column is placed the number denoting the pressure within the boiler in atmospheres, and in each column the thickness to be given to the boiler to withstand such a pressure, is stated in decimal parts of an inch.

For example, if we required the thickness which should be given to a boiler, of 30 inches diameter, to contain steam of 5 atmospheres. In the first column we find 30, and in the column headed 5, on a line with 30, the number expressing the thickness is to be found, viz .336 of an inch, or about $\frac{5}{16}$ths.

The maximum thickness for a boiler being .56 of an inch, ($\frac{9}{16}$,) as has been stated in the preceding instructions, a boiler marked 8 atmospheres must always be of a less diameter than 36 inches. The limit is 34.92 inches. A boiler, therefore, of greater diameter than this, must have a lower mark. For pressures above 8 atmospheres it is evident that the diameters must be decreased as the pressures increase.

The table gives the thicknesses of boilers having the marks of 2, 3, 4, 5, 6, 7, and 8 atmospheres, and having diameters of from 20 to 40 inches inclusive. For pressures and diameters not contained in the table, the thickness may be calculated by the following formula.

$$t=\frac{18d\,(n-1)+1200}{10{,}000}\ *$$

* From this formula, we derive,

$t=.0018d\,(n-1)+.12$, or $d=\frac{t-.12}{.0018\,(n-1)}$ $(a,)$ and $n=\frac{t-.12}{.0018d}+1$ (b)

In this formula, t represents the thickness sought, d the given diameter expressed in inches, and n the number denoting the working pressure. The coefficient 18 was obtained with reference to the proof required to be sustained by the boiler, and to the relation, deduced from practice, between the pressure of one atmosphere and the tenacity of wrought iron for a given surface.

The number 1200, added to the numerator, being divided by 10,000, expresses a constant thickness of .12 of an inch, given as a minimum thickness for a boiler to contain steam of atmospheric pressure, and added to make up for the loss of tenacity which the material undergoes in bending it, by heating, or by constant wear.

Suppose given $d = 33.2$ inches, and $n = 4\frac{1}{2}$ atmospheres, we shall have

$$t = \frac{18 \times 33.2\,(4.5-1) + 1200}{10{,}000} = \frac{597.6 \times 3.5 + 1200}{10{,}000}$$

$$= \frac{2091.6 + 1200}{10{,}000} = 329.26 \text{ of an inch.}$$

By beginning the table at 2 atmospheres it has been rendered applicable, as far as was necessary, to low-pressure boilers. It was deemed useless to give the calculations for an atmosphere and a half, inasmuch as at this pressure, manufacturers are in the habit of giving to their boilers thicknesses greater in proportion than for higher pressures.

Formula relating to the proof of Boilers, Boiler Tubes, &c.

Let W express the weight with which a valve is to be loaded, w the weight which applied by means of a lever will produce the pressure W, each being expressed in pounds and decimals of a pound. Let d be the diameter of the valve in inches and parts of an inch; n the number denoting the working pressure, L the longer arm of the lever, to which w is attached; l the shorter arm of the same lever; m the relation between the proof pressure and the bursting pressure of the steam under which the engine works. We shall have

The formula a shows for a given pressure, the greatest diameter which can be given to a boiler, without its requiring a thickness greater than that assumed as a maximum.

If we suppose this maximum thickness to be .56 of an inch and the pressure 8 atmospheres, then $t = .56$ and $n = 8$, hence

$$d = \frac{.56-.12}{.0018\,(8-1)} = \frac{.44}{.0018 \times 7} = \frac{.44}{.126} = 34.92 \text{ inches, the value already given.}$$

The formula (b) will serve to ascertain the highest working pressure of steam which can be used in a boiler of a given diameter and thickness. For example, let $t = .44$ $d = 39.2$, we shall have

$$n = \frac{.44-.12}{.0018 \times 39.2} + 1 = \frac{.32}{.7056} + 1 = 4.5 + 1 = 5.5$$

The supposed boiler cannot bear a higher mark that $5\frac{1}{2}$ atmospheres.

$$W=\frac{d^3 \times 1178\,(n-1)\,m}{100}, \quad \text{and} \quad w=\frac{d^3 \times 1178\,(n-1)\,m}{100} \times \frac{l}{L}\,(*)$$

If the boiler be of cast iron, m will correspond to five times the bursting pressure, or $m=5$; if of wrought iron, $m=3$.

Let us take a cast iron boiler as an example, then $m=5$. Also, let us suppose $d=1.5$, $n=4$, $L=24$, and $l=2$, we shall have for the direct load of the valve,

$$W=\frac{1.5 \times 1.5 \times 1178\,(4-1)\,5}{100}=\frac{2.25 \times 1178 \times 15}{100}=397.57 \text{ lbs.}$$

And for the weight to be applied to the lever

$$w=397.57 \times \frac{2}{24}=33.13 \text{ lbs.}$$

If the boiler were of wrought iron, the other data remaining the same, $m=3$, we should then have, $W=238.55$ lbs, and $w=19.88$ lbs.

(Signed,) BECQUEY,
Counsellor of State, &c.

Approved, &c.
Paris, July 12th, 1828.

The Results of Machinery.

(Continued from page 349.)

The price of *bread*—the great staff of life—has thus we see been reduced *a full half* by the substitution of wind and water-mills for the hand-mill; but even this benefit, inestimable as it is, is exceeded in degree by what has been effected by machinery in regard to other articles more or less essential to human subsistence and comfort.

The same quantity of *coal*, which can now be obtained by the aid of machinery for eighteen pence, or one day's wages of the worst paid labourer, could not be obtained without it for a whole year's wages—(p. 347.)—that is to say, it would take a man with a mattock and shovel three hundred and thirteen working days to obtain fuel sufficient for the consumption of seven! It may, in fact, with greater truth be affirmed, that without machinery, coals could not be procured at all in any considerable quantity at any price; for of what use would it be to dig pits were there neither windlass, nor horse-gin, nor steam engine to keep them dry and raise the coals to the surface?†

* In the preceding remarks, the lever is considered as destitute of weight, or, which amounts to the same thing, is supposed to be balanced upon its fulcrum by a suitable counterpoise. Although the levers in practice are not thus arranged, the allowance for their weight is generally neglected. If it were deemed necessary, in any case, to consider the pressure upon the valve by the weight of the arm of the lever, it might be done by subtracting half that weight from the load at the extremity of the arm, as shown by the above formula. Calling s this weight, and w' the constant load, we shall have, if not exactly, at least nearly enough for practice, $w'=w-\frac{1}{2}s$.

† "The sufferings produced by a want of coal cannot be estimated by those who have abundance. In Normandy, at the present day, such is the scarcity of

"In all mining operations, conducted as they are in modern times, and in our own country, we must either go without the article produced, whether coal, or iron, or lead, or tin, if the machines were abolished—or we must employ human labour, in works the most painful, at a price which would not only render existence unbearable, but destroy it altogether. The people, in that case, would be in the condition of the unhappy natives of South America, when the Spaniards resolved to get gold at any cost of human suffering. The Spaniards had no machines but pickaxes and spades to put in the hands of the poor Indians. They compelled them to labour incessantly with these, and half the people were destroyed. Without machinery, in places where people can obtain even valuable ore for nothing, the collection and preparation of metals is hardly worth the labour. Mungo Parke describes the sad condition of the Africans who were always washing gold-dust;—and we have seen in Derbyshire a poor man separating small particles of lead from the soft stone, (gypsum,) of that country, and unable to earn a shilling a-day by the process. A man of capital erects lead-works, and in a year or two obtains an adequate profit, and employs many labourers.

Water is equally necessary with bread and fuel to human existence; but it is, in most parts of England, to be had in such abundance, and at so cheap a rate, that the procuring of it seldom costs even the very poorest a thought. But let us take away machinery, and see what would then be the result.

"In some cities of Spain, where the people understand very little about machinery, water, at particular periods of the year, is as dear as wine; and the labouring classes are consequently in a most miserable condition. In London, on the contrary, water is so plentiful, that 29,000,000 of gallons are daily supplied to the inhabitants; which quantity, distributed to about 125,000 houses and other buildings, is at the rate of above 200 gallons every day to each house. To many of the houses this water is, by the aid of machinery, not only delivered to the kitchens and wash-houses on the ground floors, where it is most wanted, but is sent up to the very tops of the houses, to save even the comparatively little labour of carrying it from the bottom. All this is done at an average cost to each house of about two-pence a-day; which is less price than the labour of an able-bodied man would be worth to carry a single bucket from a spring half a mile from his own dwelling.

"And how did the inhabitants of London set about getting this great supply of water? How did they get a sufficient quantity, not only to use as much as they please for drinking, for cooking, and for washing, but obtained such an abundance, that the poorest man can afford to throw it away as if it cost nothing, into the channels which

wood, that persons engaged in various works of hand—as lace-making by the pillow—absolutely sit up through the winter nights in the barns of the farmers, where cattle are littered down, that they may be kept warm by the animal heat which is around them. They sleep in the day, and are warmed by being in the same out-house with cows and horses at night; and thus they work under every disadvantage because fuel is scarce and very dear."

are also provided for carrying it off, and thus to free his own room or house from every impurity; and by so doing to render this vast place one of the most healthful cities in the world? They set about doing this great work by machinery; and they began to do it when the value of machinery in other things was not so well understood as it is now. As long ago as the year 1236, when a great want of water was felt in London, the little springs being blocked up and covered over by buildings, the ruling men of the city caused water to be brought from Tyburn, which was then a distant village, by means of pipes; and they laid a tax upon particular branches of trade, to pay the expense of this great blessing to all. In succeeding times more pipes and conduits, that is, more machinery, was established for the same good purpose; and two centuries afterwards, king Henry the Sixth gave his aid to the same sort of works, in granting particular advantages in obtaining lead for making the pipes. The reason for this aid to such works was, as the royal decree set forth, that they were 'for the common utility and decency of all the city, and *for the universal advantage;*' and a very true reason this was. As this great town more and more increased, more water-works were found necessary; till at last in the reign of James the First, which was nearly 200 years after that of Henry the Sixth, a most ingenious and enterprising man, and a great benefactor to his country, Hugh Myddleton, undertook to bring a river of pure water above 38 miles out of its natural course for the supply of London. He persevered in this immense undertaking, in spite of every difficulty, till he at last accomplished that great good which he had proposed, of bringing wholesome water to every man's door. At the present time the New River, which was the work of Hugh Myddleton, supplies 13,000,000 of gallons of water every day; and though the original projector was ruined by the undertaking, in consequence of the difficulty which he had in procuring proper support, such is now the general advantage of the benefit which he procured for his fellow-citizens, and so desirable are the people to possess that advantage, that a share in the New River Company, which was at first sold at £100, is now worth £15,000.

"Before the people of London had water brought to their own doors, and even into their very houses, and into every room of their houses where it is desirable to bring it, they were obliged to send for this great article of life—first, to the few springs which were found in the city and its neighbourhood, and, secondly, to the conduits and fountains, which were imperfect mechanical contrivances for bringing it. The service pipes to each house are more perfect mechanical contrivances; but they could not have been rendered so perfect without engines, which force the water above the level of the source from which it is taken. When the inhabitants brought their water from the springs and conduits there was a great deal of human labour employed; and as in every large community there are always people ready to perform labour for money, many persons obtained a living by carrying water. When the New River had been dug, and the pipes had been laid down, and the engines had

been set up, it is perfectly clear that there would have been no further need for these water carriers. When the people of London could obtain 200 gallons of water for two pence, they would not employ a man to fetch a single bucket from the river or the fountain at the same price. They would not, for the mere love of employing human labour directly, continue to buy an article very dear, which, by mechanical aid, they could buy very cheap. If they had resolved, from any mistaken notions about machinery, to continue to employ the water-carriers, they must have been contented with 1 gallon of water a-day instead of 200 gallons. Or if they had consumed a larger quantity, and continued to pay the price of bringing it to them by hand, they must have denied themselves other necessaries and comforts. They must have gone without a certain portion of food, or clothing, or fuel, which they are now enabled to obtain by the saving in the article of water. To have had for each house 200 gallons of water, and in having this 200 gallons of water, to have had the cleanliness and health which result from its use, would have been utterly impossible. At two pence a gallon, which would not have been a large price considering the distances to which it must have been carried, the same supply of water would have cost about £9,000,000 sterling a-year, and would have employed, at the wages of two shillings a-day, more than one-half of all the present inhabitants of London, or 800,000 people, that is, about four times the number of able-bodied men altogether contained in the metropolis. Such a supply, therefore, would have been utterly out of the question. To have supplied 1 gallon instead of 200 gallons to each house at the same rate of wages, would have required the labour of 12,000 men. It is evident that even this number could not have been employed in such an office; because had there been no means of supplying London with water but the means of human hands, London could not have increased to one-twentieth of its present size;—there would not have been one-twentieth part of the population to have been supplied—and therefore 600 water-carriers would have been an ample proportion to this population."

The example just quoted is the more deserving of attention that among the instances of popular absurdity which have disgraced the year 1830, there has been actually one of a number of water-carriers combining to prevent, by intimidation, the extension to the city of Exeter of the same benefit from water-supplying machinery, which have been enjoyed, for centuries past, by the inhabitants of the metropolis.

The author next invites the attention of his readers to the influence of machinery in reducing the price of *clothing*. His first example is drawn from the manufacture of cotton. At the time Arkwright introduced spinning by machinery, the price of a particular sort of cotton yarn, (much used in the manufacture of calico,) was thirty-eight shillings a pound—now it costs only between three and four shillings; cottons sold then at six shillings a yard—now they average scarcely sixpence. The total annual value of the cotton manufacture did not then exceed £200,000; at present it amounts to

£36,000,000. Of the cotton cloth now made in England, about four hundred millions of yards are retained for home consumption; which, taking the population at twenty-five millions, allows sixteen yards each for every individual; eighty years ago, not one person in thirty had even a single yard to his share. In fact, although cotton stuffs were always cheaper than silk, (which was anciently sold for its weight in gold,) they were still, at the time of Arkwright, so costly as only to be purchased by the most opulent.

"The invention of Arkwright—the substitution of rollers for fingers, changed the commerce of the world. The machinery by which a man, a woman, or even a child, could produce two hundred threads where one was produced before, caused a cheapness of production much greater than that of India, where human labour is scarcely worth any thing. * * * The trade in India cotton goods is hence gone for ever. Not even the caprices of fashion can have an excuse for purchasing the dearer commodity. We make it cheaper and we make it better. The trade in cotton, as it exists in the present day, is the great triumph of human ingenuity. We bring the raw material from the country of the people who grow it, on the other side of our globe; we manufacture it by our machines into articles which we used to buy from them ready made; and taking back those articles to their own markets, encumbered with the cost of transport for fourteen thousand miles, and encumbered also with the taxes which the State has laid upon it in many various ways, we sell it to these very people cheaper than they can produce it themselves, and they buy it, therefore, with eagerness."

* * * * *

"Nor is the creation of employment amongst ourselves by the cheapness of cotton goods produced by machinery, to be considered as a mere change from the labour of India to the labour of England. It is a creation of employment operating just in the same manner as the machinery did for printing books. The Indian, it is true, no longer sends us his calicoes and his coloured stuffs; we make them ourselves. But he sends us forty times the amount of raw cotton that he sent when the machinery was first set up. In 1781 we imported five million pounds of cotton wool. In 1828 we imported two hundred and ten million pounds—enough to make twelve hundred and sixty million yards of cloth—which is about two yards a piece for every human being in the world. The workman on the banks of the Ganges, (the great river of India,) is no longer weaving calicoes for us, in his loom of reeds under the shade of a mango tree; but he is gathering for us forty times as much cotton as he gathered before, and making forty times as much indigo for us to colour it with. The export of cotton has made such a demand upon the Indian power of labour, that even the people of Hindostan, adopting European contrivances, have introduced machinery to pack the cotton. Bishop Heber says, that he was frequently interested by seeing, at Bombay, immense bales of cotton laying on the piers, and the ingenious screw, by which an astonishing quantity is pressed into the canvass bags. The Chinese, on the contrary, from the want of these contrivances, sell their cot-

ton to us at much less profit; for they pack it so loosely that it occupies three times the bulk of the Indian cotton, and the freight costs twelve times the price to which it might be reduced by mechanical skill."

Another striking instance of an important article of apparel, depending almost entirely on machinery for its general introduction, is furnished by the history of the stocking manufacture.

"Before the invention of the first stocking-machine, in the year 1589, by William Lea, a clergyman, none but the very rich wore stockings, and many of the most wealthy went without stockings at all, their hose being sewn together by the tailor, or their legs being covered with bandages of cloth. William Lea made a pair of stockings by the frame in the presence of King James I.; but such was the prejudice of those times, that he could get no encouragement for his invention. His invention was discountenanced, upon the plea that it would deprive the industrious poor of their subsistence. He went to France, where he met with no better success; and died at last of a broken heart. The great then *could* discountenance an invention because its application was limited to themselves. *They* only wore stockings; the poor who made them had none to wear. Stockings were not cheap enough for the poor to wear, and therefore they went without. Of the millions of people now in this country, how few are without stockings! What a miserable exception to the comforts of the rest of the people does it appear to you when you see a beggar in the streets without stockings! You consider such a person to be in the lowest stages of want and suffering. Two centuries ago, not one person in a thousand wore stockings; one century ago, not one person in five hundred wore them; now, not one person in a thousand is without them. Who made this great change in the condition of the people of England, and indeed, of the people of almost all civilized countries? William Lea—who died at Paris of a broken heart. And why did he die of grief and penury? Because the people of his own days were too ignorant to accept the blessings he had prepared for them."

Not content with thus establishing the truth of his general position, by examples drawn from articles of necessity, the author goes on to show some very curious effects of machinery in the production of articles, which, though trifling in themselves, are in such general use, that the want of them would be felt as a severe privation.

"There is an article employed in dress, which is at once so necessary and so beautiful that the highest lady in the land uses it, and yet so cheap, that the poorest peasant's wife is enabled to procure it. The quality of the article is as perfect as art can make it; and yet from the enormous quantities consumed by the great mass of the people, it is made so cheap that the poor can purchase the best kind as well as the rich. It is an article of universal use. United with machinery, many hundreds, and even thousands, are employed in making it. But if the machinery were to stop, and the article were made by human hands alone, it would become so dear that the richest only could afford to use it; and it would become, at the same

time, so rough in its appearance, that those very rich would be ashamed of using it. The article we mean is a pin."

* * * * *

"Needles are not so cheap as pins, because the material of which they are made is more expensive, and the processes cannot be executed so completely by machinery. But without machinery how could that most beautiful article, a *fine* needle, be sold at the rate of six for a penny? As in the case of pins, machinery is at work at the first formation of the material. Without the tilt-hammer, which beats out the bar of steel, first at the rate of ten strokes a minute, and lastly at that of 500, how could that bar be prepared for needle-making at any thing like a reasonable price? In all the processes of needle-making, labour is saved by contrivance and machinery. What human touch would be exquisite enough to make the eye of the finest needle, through which the most delicate silk is with difficulty passed? Needles are made in such large quantites, that it is even important to save the time of the child who lays them all one way when they are completed. Mr. Babbage, who is equally distinguished for his profound science, and his mechanical ingenuity, has described this process as an example of one of the simplest contrivances which can come under the denomination of a tool."

On the Effects of different Arts and Trades on Health and Longevity; abstracted from a work on that subject, relating particularly to the Manufactories of Leeds, in England, written by C. Turner Thackrah.

After a series of interesting remarks and calculations, founded no authentic data, Mr. Thackrah says—

"Taking, then, the mortality at Pickering Lythe as the natural one, there was an excess of 321 deaths in the borough of Leeds during the year 1821. And allowing for the increase of population since that period, we may fairly say that at least 450 persons die annually in the borough of Leeds, from the injurious effects of manufactures, the crowded state of population, and the consequent bad habits of life. We may say that every day of the year is carried to the grave the corpse of an individual whom nature would have long preserved in health and vigour;—every day we see sacrificed to the artificial state of society, one, and sometimes two victims, whom the destinies of nature would have spared. The destruction of 450 persons year by year in the borough of Leeds cannot be considered by any benevolent mind as an insignificant affair. Still less can the impaired health, the lingering ailments, the premature decay, mental and corporeal, of nine-tenths of the survivers, be a subject of indifference. Assuredly an examination into the state of our manufactures has long been demanded, alike by humanity and by science. The object of this paper is to excite public attention to the subject. Myself and my pupils have personally and carefully inspected the

state of the artisans in most kinds of manufacture, examined the agencies believed to be injurious, conversed on the subject with masters, overlookers, and the more intelligent workmen, and obtained many tables illustrating the character of the disorders prevalent in the several kinds of employ. From these sources collectively, I have drawn up statements, which, though avowedly imperfect, must, I conceive, approach to the truth."

Mr. Thackrah then goes into his striking details, dividing, for that purpose, the population into four great classes of operatives, dealers, master-manufacturers and merchants, and professional men; and examining "the atmosphere they breathe—the muscular exercise they take—the posture of the body they maintain—the variations of temperature and humidity to which they are exposed—their diet and habits of life; and finally, in some classes, their state of mind." We will display some of the results in almost a tabular form.

OUT OF DOORS.

"*Butchers*, and the slaughtermen, their wives and their errand-boys, almost all eat fresh-cooked meat at least twice a-day. They are plump and rosy. They are generally, also, cheerful and good-natured. Neither does their bloody occupation, nor their beef-eating, render them savage, as some theorists pretend, and even as the English law presumes. They are not subject to such anxieties as the fluctuations of other trades produce—for meat is always in request; and butchers live comfortably in times as well of general distress as of general prosperity. They are subject to few ailments, and these the result of plethora." Though more free from diseases than other trades, they, however, do not enjoy greater longevity; on the contrary, Mr. T. thinks their lives shorter than those of other men who spend much time in the open air.*

Cattle and horse dealers are generally healthy, except when their habits are intemperate.

* "Butchers, (he says,) in fact live too highly—not too highly for temporary health, but too highly for long life. Is every man gifted at birth with a portion of the pabulum of life, which he cannot increase, but which he may prematurely consume;—in other words, does nature endow us with a vital patrimony, which we may exhaust, not only by profligate indulgence, but even by regular draughts too frequently repeated? Or rather, does not high living, (for I speak not at present of excess or intemperance,)—does not high living produce that plethoric state which gradually leads to disease? I believe the latter. Congestion of blood, affecting chiefly the vessels of the abdomen and head, shortens the lives of numbers who are plump, rosy, and apparently strong. My very intelligent friend, Dr. Murray, of Scarborough," he adds, "concurs in the statement relative to butchers. 'The high living of butchers assuredly leads to plethora and premature dissolution.' He adds—'Thus coal-meters, &c. of London, rarely, if every, attain the age of forty, though men remarkable for muscular bulk and strength. They work most laboriously, perspire immensely, and supply such waste by extraordinary and almost incredible potations of porter, which ultimately, without much positive and actual intemperance, brings on irregularities of the digestive system, structural changes, and death.'"

Fishmongers, though much exposed to the weather, are hardy, temperate, healthy, and long lived.

Cart-drivers, if sufficiently fed and temperate, the same.

Labourers in husbandry, *&c.* suffer from a deficiency of nourishment.

Brickmakers, with full muscular exercise in the open air, though exposed to vicissitudes of cold and wet, avoid rheumatism and inflammatory diseases, and attain good old age.

Chaise-drivers, *postilions*, *coachmen*, *guards*, *&c.* from the position of the two former on the saddle, irregular living, &c. and from the want of muscular exercise in the two latter, are subject to gastric disorders, and, finally, apoplexy and palsy, which shorten their lives."

Carpenters, *Coopers*, *Wheelwrights*, *&c.* healthy and long lived.

Smiths, often intemperate, and die comparatively young.

Rope makers and gardeners suffer from their stooping postures.

Paviers, subject to complaints in the loins, increasing with age, but they live long.

IN-DOOR OCCUPATIONS.

Tailors,* notwithstanding their confined atmosphere and bad posture, are not liable to acute diseases, but give way to stomach complaints and consumption. "It is apparent, even from observing only the expression of countenance, the complexion, and the gait, that the functions of the stomach and the heart are greatly impaired, even in those who consider themselves well. We see no plump and rosy tailors; none of fine form and strong muscle. The spine is generally curved: the reduction in the circumference of the chest is not so much as we might expect; the average of our measurements presented 33 to 34 inches, while that of other artisans is about 36. The capacity of the lungs, as evinced by measuring the air thrown out at an expiration, is not less than common: the average of six individuals was $7\frac{3}{5}$ pints. The prejudicial influence of their employ is more insidious than urgent—it undermines rather than destroys life. * * * Of twenty-two of the workmen employed in Leeds, not one had attained the age of sixty; two had passed fifty; and of the rest not more than two had reached forty. We heard of an instance or two of great age; but the individuals had lived chiefly in the country."

Staymakers have their health impaired, but live to a good average.

Milliners, *dress-makers*, *and straw-bonnet-makers*, are unhealthy and short lived.

Spinners, *cloth-dressers*, *weavers*, *&c. &c.* are more or less healthy

* On the bent postures, which Mr. T. considers so injurious, we may remark, that a French physiologist has just published a memoir, in proof that the spinal marrow has, properly speaking, no special action upon the circulation distinct from the general action of nervous centres, and that it is not in it that the essential principle, still less the exclusive principle of the circulation resides

as they have exercise and air. Those exposed to inhale imperceptible particles of dressings, &c., such as frizers, suffer from disease, and are soonest cut off.

Shoemakers are placed in a bad posture:—"Digestion and circulation are so much impaired, that the countenance would mark a shoemaker almost as well as a tailor. We suppose that, from the reduction of perspiration and other evacuations, in this and similar employments, the blood is impure, and consequently the complexion darkened. The secretion of bile is generally unhealthy, and bowel complaints are frequent. The capacity of the lungs, in the individuals examined, we found to average six and one-third, and the circumference of the chest thirty-five inches. In the few shoemakers who live to old age, there is always a remarkable hollow at the base of the breast bone, occasioned by the pressure of the last."

Curriers and leather dressers are very healthy and live to old age.

Saddlers lean much forward and suffer accordingly from headach and indigestion.

Printers, (our worthy co-operators,) "are kept in a confined atmosphere, and generally want exercise. Pressmen, however, have good and varied labour. Compositors are often subject to injury from the types. These, a compound of lead and antimony, emit, when heated, a fume which affects respiration, and are said also to produce partial palsy of the hands. Among the printers, however, of whom we have inquired, care is generally taken to avoid composing till the types are cold, and thus no injury is sustained. The constant application of the eyes to minute objects gradually enfeebles these organs. The standing posture long maintained here, as well as in other occupations, tends to injure the digestive organs. Some printers complain of disorder of the stomach and head; and few appear to enjoy full health. Consumption is frequent. We can scarcely find or hear of any compositor above the age of fifty. In many towns printers are intemperate."

Bookbinders—a healthy employment.

Carvers and gilders look pale and weakly, but their lives are not abbreviated in a marked degree.

Clockmakers, generally healthy and long lived.

Watchmakers, the reverse.

House-servants, in large, smoky towns, unhealthy.

Colliers and well-sinkers, a class by themselves, seldom reach the age of fifty.

EMPLOYMENTS PRODUCING DUST, ODOUR, OR GASEOUS EXHALATIONS.

If from animal substances not injurious; nor from the vapours of wine or spirits.

Tobacco manufacturers do not appear to suffer from the floating poison in their atmosphere.

Snuff-making is more pernicious.

Men in oil-mills, generally healthy.

Brushmakers live to a very great age.

Grooms and hostlers inspire ammoniacal gas, and are robust, healthy, and long lived.

Glue and size boilers, exposed to the most noxious stench, are fresh looking and robust.

Tallow-chandlers, also exposed to offensive animal odour, attain considerable age.*

Tanners, remarkably strong, and exempt from consumption.

Corn-millers, breathing an atmosphere loaded with flour, are pale and sickly: very rarely attain old age.

Maltsters cannot live long, and must leave the trade in middle life.

Tea-men suffer from the dust, especially of green tees; but the injury is not permanent.

Coffee-roasters become asthmatic, and subject to headach and indigestion.

Paper-makers, when aged, cannot endure the effect of the dust from cutting the rags. The author suggests the use of machinery in this process. In the wet, and wear, and tear of the mills, they are not seriously affected, but live long.

Masons are short lived, dying generally before forty. They inhale particles of sand and dust, lift heavy weights, and are too often intemperate.

Miners die prematurely.†

Machine makers "seem to suffer only from the dust they inhale, and the consequent bronchial irritation. The *filers*, (iron,) are almost all unhealthy men, and remarkably short lived."

Founders, (in brass,) suffer from the inhalation of the volatilized metal. In the founding of *yellow* brass, in particular, the evolution of oxide of zinc is very great." They seldom reach forty years.

Copper-smiths "are considerably affected by the fine scales which rise from the imperfectly volatilized metal, and by the fumes of the 'spelter,' or solder of brass." The men are generally unhealthy, suffering from disorders similar to those of the brass founders.

"*Tinplate-workers* are subjected to fumes from muriate of ammonia, and sulphurous exhalations from the coke which they burn. These exhalations, however, appear to be annoying rather than injurious; as the men are tolerably healthy, and live to a considerable age. *Tinners* also are subject only to temporary inconvenience from the fumes of the soldering.

"*Plumbers* are exposed to the volatilized oxide of lead, which rises during the process of 'casting.'" They are sickly in appearance, and short lived.

House-painters are unhealthy, and do not generally attain full age.

*"During the plague in London it was remarked that this class of men suffered much less than others."

†"Last year there was in the village of Arkendale, (in the heart of the mining district,) not less than thirty widows under thirty years of age. The prevalent maladies appear to be affections of the lungs and bowels. Smelting is considered a most fatal occupation. The appearance of the men is haggard in the extreme.

Chemists and druggists, in laboratories are sickly and consumptive.

Potters, affected through the pores of the skin become paralytic, and are remarkably subject to constipation.

Hatters, grocers, bakers, and chimney sweepers, (a droll association,) also suffer through the skin; but though the irritation occasions diseases, they are not, except in the last class, fatal.

Dyers are healthy and long lived.

Brewers are, as a body, far from healthy. "Under a robust and often florid appearance, they conceal chronic diseases of the abdomen, particularly a congested state of the veinous system. When these men are accidentally hurt or wounded, they are more liable than other individuals to severe and dangerous effects."*

Cooks and confectioners "are subjected to considerable heat. Our common cooks are more unhealthy than housemaids. Their digestive organs are frequently disordered, they are subject to headache, and their tempers rendered irritable."

Glass workers are healthy; *glass blowers* often die suddenly.

New Process of Distillation.

We have occasion to call the attention of our readers to what will probably be deemed one of the most curious discoveries that has been effected in the useful arts during the present century,—that of procuring alcohol, or ardent spirit, from fermented paste, such as is commonly used for making baker's bread; in lieu of making an extract of malt or corn, for the especial purpose of raising a vinous fermentation, as now practised by the corn distillers. This important discovery has been made by Mr. Robert Hicks, a gentleman in the medical profession, who, we understand, has just taken out a patent for the invention.

As nearly all vegetable substances capable of undergoing the vinous fermentation are known to give out a certain portion of aroma, in conjunction with the carbonic acid gas evolved by the process, it might have been inferred, *à priori*, that at least a portion of such vapour contained gaseous alcohol. But the discovery of this fact, obvious as it may appear when once announced, has hitherto been overlooked, notwithstanding the profound discoveries which have been made in almost every department of chemical science during the last thirty years. The only doubt we entertained on the question, on hearing of this discovery, was, as to the practicability of obtaining spirit in any quantity worthy of notice, from the vapour of fermented paste, and sufficiently pure for the purposes of the rectifier. Previous to offering any notice of this important invention, therefore, we took the trouble of investigating its nature, and of tasting a sample of the spirit which had been produced from the

* "The ill health of brewers is, however, evidently attributed to their habitual and unnecessary potation of beer. There is no reason to believe them injured by their employ."

condensed vapour given off during the process of baking. The specimen we tasted served at once to satisfy us of the practicability of the process on a large scale. The sample (which appeared to be nearly the strength of proof spirit) was certainly destitute both of that empyreumatic flavour, which might have been in some measure expected from a species of *dry* distillation, like that of the baking process; while it was equally free from any fetid or unpleasant odour, such as would be supposed to result from imperfect fermentation. We should say that the spirit we tasted had a slight acidulous or ether-like quality, by no means unpleasant to the palate, but which may probably be quite got rid of by subsequent rectification. It is needless to state that it was also perfectly free from colouring matter, and apparently applicable to the most delicate purposes of the rectifiers and compounders of British spirits.

In the absence of any drawing or plate to illustrate the invention of Mr. Hicks, we shall endeavour to give such a description of the new baker's oven and distilling apparatus, as may perhaps render the invention intelligible to the majority of our readers.

The body of the oven, instead of being constructed of brick-work, is formed of iron plate, and made of a circular figure, having a coating of brick or tile for receiving the loaves, when prepared of the usual sponge or dough. This oven is supported upon hollow brick-work beneath, with a space round the sides and top, sufficient to allow the play of the flame or heated air from the fire below. About a foot beneath the bottom of the oven is a circular iron plate, of the same diameter with itself, on which rests the grate or fire-chamber, with openings for the ashes to fall through into the ash-pit beneath. This circular platform is affixed to, and made to revolve on, a vertical axis, furnished with a bevel wheel, which communicates with another bevel wheel fixed on the end of a horizontal shaft; the exterior end of which shaft is provided with a winch, to enable the platform to be kept in motion by the hand, or any other moving power that may be judged necessary. The object of applying this machinery is to keep the action of the fire uniformly distributed beneath the bottom and round the sides of the oven. But in addition to this desirable point, we are informed that a very great saving of fuel is effected, as compared with the quantity required to heat an oven of the same capacity by the common brick flues. Indeed, when we take in view the rapid conducting power of metal compared with brick-work, nearly the whole effect of the fuel must be rendered available for the double process of baking and distillation. In order to prevent any escape of the heated air or flame, the edges of the circular platform are bent downwards, and made to work in a narrow trough of water, forming what may be called a water-joint.

From the upper portion of the oven, a large chamber or pipe receives the vapour evolved from the baking process, and carries it onwards through a pipe and worm-tub, or refrigerator, as in the usual process of distillation. This vapour from the bread contains a quantity of carbonic acid gas, combined with the alcohol vapour; but the latter becomes condensed into the *liquid* form; while the

former flies off in the gaseous state, from the recipient containing the spirit.

The upper portion of the oven also contains a most ingenious contrivance for regulating the temperature of the whole process with the utmost precision. An iron tube, containing a quantity of oil, has a thermometer immersed in it, and is so contrived as to lower down into the body of the oven, and to be withdrawn at pleasure; thus preventing the possibility of the oven being overheated sufficiently to scorch the bread, or impart a disagreeable flavour to the spirit. The operative portion of this compound process seems to us to be provided for in a manner so as to leave little, if any thing, to be desired.

The practical application of this important discovery may lead to results which cannot at present be anticipated. Without offering any opinion as to the benefit to the community of the extensive consumption of ardent spirit, there can be no manner of doubt that, if it be a benefit, the more cheaply it can be procured, the greater will be the advantage in an economical point of view. If that which has hitherto been deemed a worthless vapour, can be now converted into a valuable product, as an article of almost universal consumption, the discovery must, at all events, be deemed one of great importance in civil economy, and calculated to enhance, in a very eminent degree, our national reputation for improvements in the several departments of the useful arts. How far the discovery of Mr. Hicks may be found to militate against the interests of persons at present connected with distillation from corn, it is not our business to inquire. Neither is it necessary to investigate the position in which the patentee may stand with regard to the present excise regulations relative to the distillation from grain. But the merits of the discovery can be in nowise prejudged, as a scientific process, by the influence it may exercise on any question of manufacturing speculation. With regard to the influence it may have indirectly upon the agricultural interests of the country, from a considerable diminution of the consumption of grain, we are not enabled at present to form any estimate. It will assuredly tend to diminish the enormous consumption of barley at present required for the use of the corn distillers; but when it is considered that the growth of barley in this country is not adequate to such consumption, and that a considerable sum in specie is annually paid to the foreign agriculturist for the importation of grain, without the smallest return being made as a compensation to our manufacturing interests; it is doubtful whether the English agriculturist would eventually suffer by the general introduction of this invention for saving the consumption of grain in the process of distilling. Another important saving will be effected in the consumption of fuel at present used for distillation, which forms so large a portion of the outlay required in this extensive branch of manufacture. We have heard it stated, (but almost deem it incredible,) that the sponge necessary to form the peck loaf is capable of yielding three ounces, imperial measure, of proof spirit during the operation of baking, and without prolonging the process beyond the ordinary time for baking the quartern loaf. It is also stated, that

the bread baked by this new oven is superior in quality, and more porous in texture, than that baked in the usual way, from the vapours being carried off as fast as they are generated by the new patent oven, while a great portion may be presumed to be again condensed and incorporated with the bread by the old process. The invention in a variety of respects, will be likely to excite no ordinary attention in the public mind, the moment it is reduced to practice. [*Literary Gazette.*

Meteorological Observations for May, 1831.

Days.	Moon.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun Rise.	Barometer. 2 P.M.	Dew point	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches.				Inches.	
1	☽	47°	57°	29.45	29.45	44	NW. W.	Moderate.		Cloudy day.
2		46	62	.45	.45	44	W. W.	do.		Cloudy day.
3		52	72	.56	.56	46	S. S.	do.		Clear day.
4		54	64	.50	.50	45	W. W.	Blustering	.2	Rain—Flying clouds.
5		44	66	.70	.70	43	W. W.	Moderate.		Clear day.
6		41	64	.80	.90	42	W. W.	do.		Clear—cloudy.
7		46	67	.80	.70	42½	W. S.	do.		Cloudy day.
8		49	55	.54	.50	49	E. W.	do.		Cl'dy—rain—flying cl'ds.
9		35	59	.35	.44	33	W. W.	Blustering		Cloudy—flying clouds.
10		37	59	.20	.24	32	W. W.	Moderate.		Ice—clear day.
11		44	54	.85	.90	36	SW. W.	do.		Clear day.
12		44	73	.95	30.05	36	S. S.	do.		Overcast—clear.
13		28	76	30.10	.10	30	S. S.	do.		Clear day.
14		57	76	.14	.14	51	S. S.	do.		Clear day.
15		56	74	.14	.14	60	E. E.	do.		Cloudy—clear.
16		56	73	.04	.01	62	SE. SE.	do.		Drizzle—cloudy.
17		62	72	29.95	.05	60	E. SW.	do.		Drizzle—clear.
18		59	69	.90	.90	64	SE. SE.	do.		Foggy—flying clouds.
19		62	80	.80	.80	63	SE. SE.	Blustering	.12	Rain—flying clouds.
20		64	75	.70	.70	51	SW. W.	Moderate.		Cloudy—clear.
21		59	74	.80	.80	54	SW. W.	do.	.3	Flying cl'ds—slight shw'r.
22		57	76	.80	.80	52	S. S.	Blustering	.12	Clear day—rain in night.
23		59	76	.80	.80	49	NW. W.	Moderate.		Clear—cloudy.
24		54	70	.75	.75	48	W. NE.	do.	.9	Cloudy—rain
25		54	61	.60	.60	53	W. W.	do.	.30	Cloudy—flying clouds.
26		51	67	.50	.55	54	W. W.	do.		Clear—hail—rain
27		59	71	.50	.70	50	W. W.	do.	.7	Clear—shower—clear.
28		57	72	.62	.94	64	W. W.	do.		Clear day.
29		60	69	.90	.94	59	W. W.	do.		Clear day.
30		60	69	.94	.94	63	W. W.	do.		Clear day.
31		67	69	.94	.95	52	W. W.	do.		Clear day.
Mean		53.61	71.39	29.76	29.77	93			1.33	In. of rain in the month.

		Thermometer.	Barometer.
Maximum height during the month,		92. on the 31st	30.14 on 14th & 15th.
Minimum	do.	37. on the 10th,	29.30 on the 8th.
Mean	do.	62.50	29.765

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